

Nuclear Energy Law in the UAE:
An evaluation of issues of potential liability
in the country's nuclear power programme

(Volume 1)

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DECLARATION

I hereby declare that this thesis is my own work and effort and that it has not been submitted anywhere for any award.

Signed..... (Candidate)

Date.....

DEDICATION

This work is dedicated to Allah Almighty and my family members.

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LIST OF ABBREVIATIONS

AC:	Alternating Current
ADR:	Alternative Dispute Resolution
ANS:	American Nuclear Society
BSS:	Basic Safety Standards
CBD:	Convention on Biodiversity
CEO:	Chief Executive Officer
DC:	Direct Current
DOT:	Department of Transport
EEC:	European Economic Community
EFNE:	Environmentalist for Nuclear Energy
ELINI:	European Liability Insurance for the Nuclear Industry
EMANI:	European Mutual Association for the Nuclear Industry
ENEC:	Emirates Nuclear Energy Corporation
ENSREG:	European Nuclear Safety Regulators Group
EIA:	Environmental Impact Assessment
EPR:	European Pressurised Reactor
ERC:	Emergency Response Control
EU:	European Union
EURATOM:	European Atomic Energy Union (Treaty)
FANR:	Federal Authority of Nuclear Regulation
GATT:	General Agreement on Tariffs and Trade
GDP:	Gross Domestic Product
GNEII:	Gulf Nuclear Energy Infrastructure Institute
GCC:	Gulf Co-operation Council
HRA:	Human Reliability Analysis
HLW:	High Radioactive Wastes
IAB:	International Advisory Board
IAEA:	International Atomic Energy Agency
INES:	International Nuclear Event Scale
KEPCO:	Korea Electric Power Company
KNPP:	Kudankulam Nuclear Power Project
KWh:	Kilowatt hour

NEA:	Nuclear Energy Agency
NDA:	Nuclear Decommissioning Authority
NPP:	New Power Plants
NPT:	Non-Proliferation Treaty
NRC:	Nuclear Regulatory Commission
NTI:	Nuclear Threat Initiative
OECD:	Organisation for Economic Co-operation and Development
PRA:	Probabilistic Risk Assessment
SFP:	Secondary Financial Protection
TBT:	Test Ban Treaty
UK:	United Kingdom
UNO:	United Nations Organisation
USA:	United States of America
USDS:	United States Department of State
USEPRI:	United States Electric Power Research Institute
USNRC:	United States Nuclear Regulatory Commission
USSR:	United Soviet Socialist Republics
WANO:	World Association for the Nuclear Operators
WNA:	World Nuclear Association
WTO:	World Trade Organisation

ABSTRACT

The increasing responsiveness to the possibility of nuclear energy in meeting global demand for electricity is enormous; more than 8% comes from nuclear power plant. Several countries have utilised nuclear power reactors for their energy supplies. This demand is due to the rapid socio-economic developments. Hence, standards of living of such countries have been enhanced considerably. These can mainly be attributed to stable power generation and supply. The United Arab Emirates (UAE) in the Middle East, which comprises of seven fast developing emirates, is currently embarking on power generation through a peaceful nuclear energy programme. The country requires tremendous power supplies to meet their demands. The energy needs of the UAE have increased such that the traditional methods of power production do not satisfy the needs of the country.¹ There seems to be an absence of clarity about the responsibilities of the government in terms of liability during incidents of misuse of the nuclear plants. The research therefore considers the determination of the efficacy of the country's nuclear energy laws in dealing with potential liabilities arising from the energy programme. While determining civil and State liabilities in the UAE's nuclear energy programme through the analysis of existing local and international laws regarding the programme, the research analyses aspects of liability and requirements for possessing nuclear energy for peaceful purposes through the analysis of the natures and impacts of past Chernobyl, Fukushima, Three Mile Island and Windscale nuclear disasters to identify potential liability issues and their perpetrators. Thus, the lessons of the past will help to shape the future of UAE developments in this area. An analysis of the natures and scopes of existing nuclear energy laws in the UAE and those of the international community is conducted to determine possible flaw(s) and opportunities for the review of liability concerns for relevant parties. The research evaluates the extent to which the new UAE nuclear law addresses potential liabilities and further makes recommendations towards the effective and safe use of nuclear energy by the UAE through compliance with international best practices.

¹ Bin Zayed Al Nahyan, 2008 cited in Dr. Bryan R. Early, 'Export Control Development in the United Arab Emirates: From Commitments to Compliance, Belfer Center for Science and International Affairs, Harvard Kennedy School, July 6, 2009.

CHAPTER ONE:

INTRODUCTION AND METHODOLOGY

1.1 Introduction of the thesis

It is noted that the energy needs of the UAE have increased to the extent that the traditional methods of energy production no longer satisfy the needs of the country.² This thesis therefore presents a systematic study to identify the key parameters affecting the present nuclear liability processes, while pursuing the prospects of UAE's (United Arab Emirates) nuclear programme. The thesis analyses how genuine claims would be managed under the contemporary state and civil law meant for accidental damage in the UAE (United Arab Emirates). In this way victims of nuclear accidents would be accorded due justice.

Chapter One forms the introductory part of the thesis. It analyses the scope and rationale of the research. It outlines the aims and objectives of the study. Chapter One also provides further background information about the research and discusses the justifications for carrying out this research. It discusses in detail the significance of the research and introduces nuclear liability and compensation issues. Chapter One further discusses the original contributions that the research makes to the body of knowledge in this area of study.

Chapters Two, Three and Four provide a logical study and assessment of the feasibility of the UAE's nuclear liability issues. Moreover, this work describes a methodical investigation into managing and monitoring potential liabilities in the case of UAE possessing nuclear energy. Chapter Five analyses past major nuclear incidents, which include: Chernobyl, Fukushima, Three Mile Island and the Windscale disasters. Chapter Six shows an analysis of the research results, while Chapter Seven presents the Conclusions and Recommendations of this work.

² Embassy of the United Arab Emirates, Washington D.C. (2015). Electricity: Rapidly Expanding Needs. [Online]. Available at: <http://www.uae-embassy.org/about-uae/energy-uae> Accessed on 26/07/2016.

1.2 Rationale and scope of the research

Nuclear energy and liability law is very new to the United Arab Emirates (UAE) and the Middle Eastern region. This presents some pertinent issues for consideration, especially due to the sensitive nature of nuclear power production. The country is currently developing its nuclear power programme, billed to be commissioned in the year 2017. The UAE has enacted two significant laws to regulate its nuclear power programme. They are: Law No. 6 of 2009 on Nuclear Energy and Law No. 4 of 2012 on Nuclear Liability. Law No. 6 deals with the development of nuclear energy in the country while Law No. 4 considers issues regarding how potential liabilities would be managed should there be disaster(s).³

Energy drives human life and is extremely important for continued human development.⁴ As the years go by, the energy needs of the UAE increase. It has come to the point that the traditional methods of energy production do not satisfy the country's needs⁵. The UAE

³Key features of Law No. 6 include the following:

- The establishment of the Federal Authority of Nuclear Regulation (FANR), a fully independent nuclear safety regulatory authority, which aims to oversee the nuclear energy sector in the state and to promote the highest standards of nuclear safety, nuclear security and radiological protection. All regulated activities are prohibited except in accordance with a licence issued by FANR;
- The development of a robust system for the licensing and control of nuclear material; and
- The criminalisation and assignment of harsh civil and criminal penalties for violating the law, including the unauthorised use, theft, transport or trade in nuclear materials.
- The licensees' responsibilities are defined by the law in this manner: *Each Licensee shall be responsible for taking all steps necessary to reduce the risk of an accident to a level that is as low as reasonably achievable.*

Law No. 4 was established to determine civil liability and compensation for nuclear damage in the UAE. It represents a transposition into UAE law of obligations contained in nuclear liability conventions and incorporates the fundamental principles contained in those conventions, namely:

- the channelling of the entire legal responsibility for nuclear damage exclusively towards the operator
- the possibility of establishing the operator's liability without having to prove negligence
- the exclusive jurisdiction of the courts of countries where the nuclear accident occurs
- the limitation of the amount of liability and the possibility of setting a time limit for such a liability
- the compensation of damage without discrimination on the basis of nationality, domicile, or residence

The objectives of Law No. 4 include:

- to regulate the provisions and determine the scope of the civil liability and compensation for nuclear damage
- to determine the financial security that the operator must maintain
- to apply the 1997 Vienna Convention on Civil Liability for Nuclear Damage wherever no provision is made in this Law by Decree

⁴ Asif, M. and T. Muneer (2005). Energy Supply, its Demand and Security issues for Developed and Emerging Economies. *Renewable and Sustainable Energy Reviews*. Elsevier Ltd. Page 1389.

⁵ Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy, Released April 20, 2008. Available at: <https://pcs.enec.gov.ae/Content/Home.aspx>. Last accessed on 24th August, 2012.

thus considered producing energy through nuclear power.⁶ The assertiveness of the country's development of its nuclear power programme is in line with envisaged nuclear renaissance.

The ever-increasing global need for power has favoured the value of this topic as the subject for research. It can be used as a guide for other countries hoping to engage in nuclear energy development, as this study is a detailed account of the activities of the UAE in development of its nuclear power projects. They can benefit from this study. The research considers the liability aspects as well as the requirements for possessing nuclear energy for peaceful purposes.

Although the UAE is currently strategising its policies for nuclear energy, there is an absence of clarity on the position or responsibilities of government, in terms of dealing with liability during accidents or misuse. Hence the research is conducted to address issues of civil and State liabilities in the nuclear power programme of the UAE, through the study of existing local and international laws.

The participation of the UAE government in the building of nuclear power reactors will assure the global community of the proper utilisation of nuclear fuel and will not create panic as to the illegitimate use of that fuel. Changes can be made in the way the nuclear power plants work by providing opportunities to private entrepreneurs to undertake power production from nuclear power plants, with a supervisory role to be played by the government. This can benefit the international community with greater economic development in the country and even the region, from cheaper and safer power.

The main objective of the UAE is to produce power through nuclear energy to meet the needs of the country.⁷ This seems to be a more justifiable use of nuclear power than the strengthening of the military forces. This is seen to be very sustainable. The UAE's practice regarding their nuclear programme has become a model for other countries in the region to explore. This research therefore becomes a source of information for those in search of a comprehensive study about nuclear power projects in the country.

⁶ Jack Caravelli, *Beyond Sand and Oil: The Nuclear Middle East* (Praeger Security International).

⁷ See Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy.

Therefore, this research was necessitated by the need for robust strategic regulatory policies and framework concerning development of peaceful nuclear energy in the UAE and most importantly, the issue of settlement of liabilities for damages. In this way, victims of nuclear incidents would be accorded due justice.

1.3 Aims and objectives of the research

1.3.1 Aims of the research

The **central aim** of the thesis is to determine the nature and scope of potential liabilities within the Nuclear Energy Programme in the UAE.

The **further aims** of the research are as follows:

- i. In order to evaluate the central aim, it would be necessary to evaluate the development of the UAE nuclear energy programme. It is important to highlight here that the programme is still in its infancy. Hence, the consideration for potential liabilities would ideally need to be assessed prior to extensive implementation of the programme.
- ii. To fully evaluate potential liabilities, case studies and interviews that have been conducted to show the likely range and type of hazards and risks, would need to be evaluated.

1.3.2 Objectives of the research

In order to achieve the main aims of the research, the following objectives are addressed:

- i. To review literature on issues pertaining to the UAE nuclear energy development and evaluate State liability for nuclear accidents.
- ii. To evaluate the operator's liability for nuclear emissions under the State and Civil law for accidental damage.

- iii. To evaluate liability for orphan sites,⁸ characterise the state and civil law for accidental damage,⁹ and to make recommendations on how the law can be used to determine issues regarding state and civil liabilities in nuclear power production in the UAE.

1.3.3 Summary statement

This study presents the original contributions to UAE's civil liability issues regarding the country's nuclear power programme. This research highlights the lessons learnt and knowledge gained from the experiences of previous nuclear accidents, giving utmost importance to the protection of nuclear power plants, inhabitants and the environment. The country abides by the international conventions and guidelines relating to procurement and protection of nuclear reactors.

UAE benefits from the commercial viability of nuclear power generation, which hints at an expectation for huge development in the business areas. The researcher thinks that the demand for electricity would rise at an alarming rate and that it would not be possible to satisfy the demand without investing in a nuclear energy programme. In the same vein, the World Nuclear Association (2016) has stipulated the following facts:

- “The world will need greatly increased energy supply in the next 20 years, especially cleanly-generated electricity.
- Electricity demand is increasing twice as fast as overall energy use and is likely to rise by more than two-thirds from 2011 to 2035. In 2012, 42% of primary energy used was converted into electricity.
- Nuclear power provides about 11% of the world's electricity and 21% of electricity in OECD countries.

⁸ “An orphan site is a radioactive source which is not under the regulatory control, either because it has never been under such regulatory control or because it has been abandoned, lost or whose possession or ownership has otherwise been transferred in the absence of an appropriate license. It is usually when an operating company goes bankrupt and liability cannot be apportioned to any other party hence the public purse will have to pick up the liability”. See UAE Nuclear Law Decree No. 6 of 2009.

⁹ Where the system which includes no neutral tribunal is provided and claimants are generally required to file claims in the courts where the nuclear installation is located, even with respect to nuclear transports on the high seas, with attendant costs, concerns about neutrality of the courts and law, and limitations of recoverable damages. See [Duncan, E. and J. Currie (2006). *The Problems and Gaps in the Nuclear Liability Conventions and an Analysis of How an Actual Claim Would be Brought Under the Current Existing Treaty Regime in the Event of a Nuclear Accident*. Denv. J. International L. & Pol'y 35:1, 85].

- Nuclear power is the most environmentally benign way of producing electricity on a large scale.
- Renewable energy sources such as solar and wind are costly per unit of output and are intermittent but can be helpful at the margin in providing clean power”¹⁰

This study discloses that the two discourses (which are discussed on pages 9 and 10) characterise two different belief systems which rest in diverse realistic and imaginary levels. It also considers control relations at the global and domestic levels concerning the exploitation of nuclear technology for peaceful purposes. This study offers some recommendations for managing potential liabilities in the UAE’s nuclear power programme, as well as some original contributions to knowledge in this field.

1.3.4 Statement linking the aims, objectives and methodology

This research addresses the difficulties and gaps in the existing nuclear liability regimes and analyses how legitimate claims would be managed under the contemporary state and civil law for accidental damage. Understanding of the research problem is based upon the analysis of the international nuclear power regulations. This is approached using a desk based legal research and through interviews conducted with selected individuals, as the main sources of information for the thesis. In context, this approach explores different concepts: an extensive literature review and a questionnaire. The research result will open a pathway to the UAE’s decision makers towards implementing various nuclear power regulations.

1.4 Importance of the research

Basically, the research provides knowledge for the benefit of parties seeking to develop nuclear energy within UAE from a commercial perspective. There is a lack of specialised knowledge in this area, specifically within the UAE and this research will help to create more awareness in this regard. This research is aimed at providing a source of literature on the legal responsibilities which deals with developing nations, as well as other nations embarking on nuclear energy programmes and especially the countries in the Middle East.

¹⁰World Nuclear Association (2016). World Energy Needs and Nuclear Power. (Updated June 2016) [Online]. Available at: <http://www.world-nuclear.org/information-library/current-and-future-generation/world-energy-needs-and-nuclear-power.aspx> Accessed on 27/07/2016.

The thesis provides a foundation for future studies on nuclear programmes in the UAE. It also gives a detailed account of the moral and ethical issues in nuclear power production and analyses the different approaches that can be explored while deciding on the right type and model of nuclear reactor that should protect future generations.

It analyses the duties of a nation which is generating nuclear power to the rest of the world, through review of the international conventions, treaties and obligations. The researcher therefore warns the international community regarding the possibility of nuclear accidents and the dangers and advises on adherence to international standards of safety and security to reduce the dangers of such accidents.

1.5 Outline of the research

Chapter One generally introduces the thesis. The consideration of the UAE as a sovereign state, as well as the country's motivation and preparedness to possess nuclear energy is looked at. This is done with the aim of highlighting the motivations for the research in relation to current social and political developments within UAE. It broadly discusses the introduction to nuclear liability and compensation issues in nuclear power generation.

Issues regarding the UAE's nuclear liability are considered in Chapters Two, Three and Four. The study examines how potential liabilities would be managed and monitored if UAE possesses nuclear energy. While the fifth chapter analyses past nuclear incidents, Chapter Six analyses the research results. The last, Chapter Seven forms the Conclusion and Recommendations part of the study.

1.6 The PhD elements of the research

The UAE is currently building its organisational and institutional structures for its nuclear power programme.¹¹ This study seeks to expand the knowledge in the management of liabilities arising from possible disasters in the UAE's nuclear energy programme.

¹¹**Plans include:** Energy Planning Study (2006), Nuclear Policy (2008) then First unit followed by sustainable programme Infrastructure Development by 2017. Programme objective to safely deploy first plant by 2017. This implies a first concrete in 2012. Would represent one of the fastest deployment schedules

Since most of the literature in this area is from the perspectives of developed countries, relatively, little has been written about developing countries including the UAE. The importance of this study is therefore emphasised as ground breaking and shows aspects of originality and PhD focus. The outcome of this study forms the basis for subsequent studies on the nuclear agenda in the country.

The PhD element of the research therefore identifies any lacuna in the UAE legislation regarding both state and civil liabilities in the event of accidents. This study provides useful knowledge in the field of nuclear power within the UAE and creates awareness for firms seeking investment opportunities in this area. This research is conducted to address issues of UAE civil and state liability during accidents or misuse by analysing the existing local and international laws. It therefore identifies and fills any gap in the UAE legislation regarding both state and civil liabilities in the event of accidents.

The cause and effect of development in the UAE nuclear programme will create a new economic condition that has the potential to create the fifth largest system of international economic trade.¹² The author therefore maintains that for this to be happen, the country needs to consider the formulation and implementation of standard regimes to deal with the delicate energy project.

1.7 Case study of the UAE and contribution to knowledge

The researcher uses the UAE as the case study in this research and can be seen throughout the thesis. Although this is the researcher's home country, it should not be perceived this way instead should be seen as a first timer or a new developing provider of nuclear power. In the light of this, it is therefore important to look at international nuclear and political

Policy Principles include: complete operational transparency, highest standards of non-proliferation, highest standards of safety and security, lose cooperation with the IAEA, partnership with governments and firms of responsible nations and long-term sustainability.

Laws include: UAE Law No. 6 of 2009 on Nuclear energy and UAE Law No. 4 of 2012 on nuclear liability.'

See: Hamad Alkaabi (2013). UAE Nuclear Power Programme: Embarking on the Development of Nuclear Energy. St. Petersburg, 28th June 2013 as Permanent Representative of the UAE to the IAEA. [Online]. Available at: <http://www-pub.iaea.org/iaeameetings/cn206p/Panel3-Alkaabi.pdf> Accessed on 27/07/2016.

¹² See Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy.

regimes and the way the country can benefit from these evaluations towards ensuring a hitch-free nuclear energy development.

It is also important to bear in mind that there may be the occurrence of accident(s) or the misuse of nuclear plants during this venture and therefore leaves one to think about whose responsibility it would be when these eventually happen. International instruments including the Paris and Vienna Conventions provide that it would be the responsibility of the operator. The researcher sees the operator of a nuclear plant from the perspective of true ownership in spite that the plant(s) could be contracted. Here, the true owner has agreed with the IAEA to operate based on globally acceptable standards and policies and should work towards these. This means therefore that there should be clarity on the responsibility of the UAE as the owner and operating country and the resolve and effectiveness of the country's nuclear regimes to deal with issues of liabilities should accident or misuse occurs.

In considering the probable dangers and liabilities related to this imperative and possibly risky activity, the researcher looked at these aspects by the establishment of international, regional and local liabilities presented within a review of the nature of relevant organisations. The analysis of the UAE was formed through the comparative investigation of these international obligations. Here, various literatures, reports, major nuclear incidents and available nuclear laws of the UAE have been consulted and the identification of emerging trends in the development of nuclear energy and liabilities was achieved. These trends were then linked to developments within the UAE.

In order to undoubtedly show the original contribution to knowledge, the primary data obtained from structured interviews were reviewed and evaluated, findings presented and conclusion drawn. Also, recommendations were established towards the effective and safe use of nuclear energy by the UAE through compliance with international best practices as well as proposals for future development made. The research evaluates the extent to which the new UAE nuclear law addresses potential liabilities.

This study contributes to the limited knowledge on nuclear energy in developing countries in general and the UAE in particular by determining that it is possible that, in line with international regimes, sovereign and contracting States can use local laws to decide or

address potential liabilities arising from the nuclear energy programme. The outcome of the analysis of interviews with main experts in the field within the UAE is also a contribution to knowledge.

States' ratifications to international instruments relating to nuclear accidents and damages make it easier to score their readiness to nuclear power production. Regulatory compliance and strict adherence to led down and required standards and as a matter importance should not be undermined. Complete removal of excessive burden of proof on the part of the sufferer of nuclear accidents needs to be effected as this can be tedious and influential to justice. This makes liable person responsible for damages or accidents.

Using UAE as the case study, it is proposed that a sovereign state through its constituted authorities, stringent laws and setting up of compensation limits can deal with harms that may arise from nuclear power production. This can be attributed to state or civil liability.

It could also be discovered that the formulation and institution of a regulatory body as well as single legal mechanism dealing with all aspects of nuclear power and especially nuclear liability issues within the GCC member countries can encourage ethical nuclear power production in the region. The researcher therefore proffers that Gulf regional states should develop a model for the urgent notification of nuclear incidents occurring in any country within the region. This will ensure immediate response to nuclear incidents to avoid further damage for such incidents.

1.8 Methodology and theoretical considerations

The researcher sees research as an orderly study of materials and sources to ascertain new facts and achieve conclusions. Such activity is carry out to comprehend human activities and relations through suitable theoretical and procedural approaches so that the researchers have useful and appropriate data to enable them to answer their initial research questions¹³ For this research, the method used to obtain results that compliments the aims and objectives of the study.

¹³ Ghauri, P. & Grønhaug, K. (2005). Research Methods in Business Studies: A practical guide, Prentice Hall; Saunders et al, (2009).

This research analyses the challenging discussions on nuclear energy in UAE by looking at the diverse connotations of the ideas which were promoted to bring about energy security policy. Being a growing economy, UAE tries to meet its energy needs. In this context, nuclear energy is presented as ‘the solution’ to the ‘problem’ of shortage of energy. On the other hand, starting from mid-2006, these attempts have featured environmentalist and anti-nuclear challenges, supposing that nuclear power generation, is indeed a ‘problem,’ and the ‘solution’ to UAE’s energy shortage should be sought in other alternatives, mostly renewable energy resources. The discussions of policy makers demonstrate how they created the meaning of nuclear energy as ‘power’ or an ‘asset’ for state security.

Correspondingly, the thesis reveals what nuclear power means in the discourses of the opposition and how they constructed ‘nuclear’ as ‘the threat to life’. It shows how international standards and belief systems on nuclear non-proliferation, peaceable use of nuclear power, energy security, environmentalism and anti-nuclearism have formed the arguments.¹⁴

The study discloses that the two discourses indicate two separate belief systems which rest in different useful and hypothetical levels. They include: Realism and Green Political Theory influenced by Egocentrism, Marxism and Critical Theory.¹⁵ The thesis therefore hypothesises that it is possible that these two discourses can still be reconciled within reach of Constructivism. Though the general points evaluated from analysis of discourse provides ordinary grounds for ‘Critical Engagement’ among the government and civil society, else the ‘conflict’ can go ‘extreme’ if the government neglects the public’s concerns and the civil society could protest at the expense of the prospect to manipulate the policy under consideration.

Simply and most generally, realism is the view that entities of a certain type have an objective reality that is entirely ontologically autonomous of our theoretical schemes,

¹⁴Udum, Sebnem (2010). Understanding the Nuclear Energy Debate in Turkey: Internal and External Contexts. A Ph.D. Dissertation, Department of International Relations, Bilkent University, Ankara, Turkey. Pp 195-196.

¹⁵ See Udum, Sebnem (2010). P 83.

linguistic practices and beliefs.¹⁶ Realists consider that reality subsists sovereign of the human mind. The definitive certainty is the world of substantial objects.¹⁷ Therefore, this research considers realism which confirms the UAE's confidence to possess nuclear power. The common belief of all green theorists is in the universal applicability of basic green values, to which we have no objection and it is doubted that any of these theorists would clearly deny that green political actions which involve deliberate and strategic choices but must react to the broader political and institutional circumstances.¹⁸ This means that the UAE is right in the pursuit of its nuclear programme and so the research in this direction is important.

This research also considers epistemology and ontology as the bases for seeking knowledge in the area of study. Epistemology means the study of knowledge.¹⁹ It developed as one of the two branches of the science of metaphysics meaning after or beyond the physics. Metaphysics is comprised of epistemology and ontology, meaning study of the universe and those universal concepts which apply to everything, as well as those definite concepts having to do with the most significant aspect of Being.²⁰

This work reveals the central implications the actors allocated to concepts like nuclear energy, radiation and security. It discovers the reference points of the proponents are the state, economy, and the environment in terms of its input to the economic processes and the continued existence of the state. Conversely, the opposition has upheld environmental protection and human health.

This thesis presents a systematic study to identify the key parameters affecting the present nuclear liability processes and analyses how genuine claims would be managed under the contemporary state and civil law meant for accidental damage in the UAE. This research

¹⁶Mastin, Luke (2008). [Online]. Available at: The basics of Philosophy. http://www.philosophybasics.com/branch_realism.html Accessed on 15-08-2016.

¹⁷ Cohen, LeoNora M. (1999). [Online]. Philosophical Perspectives in Education. OSU - School of Education. Available at: <http://oregonstate.edu/instruct/ed416/PP2.html> Accessed on 18-09-2016.

¹⁸Hunold, C. & Dryzek, J. (2005). Green political strategy and the state: combining political theory and comparative history. In: The State and the Global Ecological Crises: [Online]. Available at: https://books.google.co.uk/books?hl=en&lr=&id=-Sri_ZJX2hoC&oi=fnd&pg=PA75&dq=Green+Political+Theory&ots=-fCRCTkeap&sig=CVTnCBwSYDcPeHhJs3Mna7L6WA4#v=onepage&q=Green%20Political%20Theory&f=false Accessed on 15-08-2016.

¹⁹ Fox, Larry (1999). Foundations: A Manual for the Beginning Student of Epistemology. University Press of America: Ney York.

²⁰ See Fox, Larry (1999).

considers nuclear energy and its role in development, judging from the stance of developed nations through the evaluation of the extent to which the new UAE nuclear law addresses potential liabilities.

It is important to clarify the type of research to be conducted. There are numerous approaches and it was clear to the researcher that a proper appreciation of the nature of legal research was required, as well as a clear understanding of how other research approaches could be used to support this prime approach.

Research can be sorted into differing types, depending upon the goal to be achieved. For example, it can be classified as²¹:

- i. Descriptive - where one seeks to discover more about an issue and to try to clarify that issue by reference to detailed information. In this thesis, there is an element of descriptive analysis where the prevailing nature and legal norms concerning nuclear energy provision are identified and reviewed.
- ii. Exploratory - where the researcher is seeking to identify new areas of information or knowledge and to consider symptoms or actions on an issue. Again, the researcher has sought to include this approach in seeking to provide explanations for the use of peaceful nuclear energy and to provide structured guidance for the adoption of such practices within the UAE.
- iii. Explanatory - this can be used when the previous types still lead to questions of ‘why?’ and ‘how?’ - and the researcher has adopted this approach in seeking to rationalise the nature of nuclear energy law and its application to the UAE and then further sought to explain how these standard international provisions can be utilised within the UAE environment. Therefore, the researcher uses structured interviews to gather primary research data.

Thus, it was necessary to identify the nature of source materials. The researcher adopted a desk-based approach to the identification of primary legal source materials and, by way of extension, the extensive materials found within the specific subject field itself. So,

²¹ See, for example, Wisker, G. (2001). *The Postgraduate Research Handbook* (Palgrave) at Ch.11.

elements of, *inter alia*, social practice, politics and economics were identified, which would help to support the basic themes running through the thesis.

In legal research, it is important to stress that the primary source materials are likely to be the legal documents themselves - treaties, statutes and case decisions. "Primary sources are those sources which are direct, authoritative and not influenced by anybody's opinion. Under this category will fall documents of an original nature or legislation or statutes or treaties or any other document of similar status."²²

The method adopted should ensure that there is a substantive approach to the identification and analysis of such materials. These materials provide a neutral and objective source of information and can be considered to be 'alive'. By comparison, the commentaries on such source materials are secondary sources for the legal researcher, and it is important to appreciate the unbiased nature of such sources. Therefore, the research is objective in nature.

The standard methodology in legal research is referred to as 'doctrinal' or 'black letter' in approach. There needs to be, to support the analysis of primary documents, a critical analysis of the secondary sources.²³ This can help the researcher to identify 'what is known and what is not known' about the field of study under review.²⁴ There is a lack of substantive material available in the UAE and this is what makes this study original.

To support the desk based research approach and to enhance the originality of the thesis, it was decided to conduct several structured interviews with identified experts within the field of study. To an extent, this is an approach based within the so-called 'Grounded Theory'. In a general sense, this approach was used to provide expert opinion and experience as a means of validating the analysis of the primary source materials. This supports the researcher's contention that the aims of the research are developed alongside the processes used. This is derived from the need to constantly check one's findings against the available data, as Denscombe has stated:

²² Chatterjee, C. (2000). *Methods of Research in Law* (Old Bailey Press) at p.20.

²³ See the following chapter for the extensive literature review of such secondary sources

²⁴ M Walter (2010). *Social Research Methods* (Oxford University Press) at p.485.

“Good qualitative...research, per the principles of grounded theory, involves a constant checking of the analysis (theories, concepts) against the findings and a constant refinement of the concepts during the process of research.”²⁵

The researcher found this approach to be valuable, because the nature of the subject matter is evolving and there were new issues and areas of concern developing during the research process. It provided for the interpretation of the stated legal sources, and allowed for a more critical evaluation of their scope and impact within the on-going nuclear programme in the UAE. This approach was further supported by the following statement by Strauss and Corbin²⁶, where they argue that a clear perspective can be enhanced and modified using new and current evidence and information:

“A grounded theory is one which is inductively derived from the study of the phenomenon it represents. That is, it is discovered, developed and provisionally verified through statistic data collection and analysis of data pertaining to the phenomenon. Therefore, data collection analysis and theory stand in reciprocal relationships with each other; one does not begin with a theory, then prove it, rather one begins with an area of study and what is relevant to that can emerge.”²⁷

In the present thesis, then, the area of study is nuclear energy law and the structured interviews conducted are the measures of the currency and relevancy of the issues indicated within the overall approach.

As mentioned earlier, this is a desk based legal research, with interviews conducted with selected individuals to inform the thesis. This approach explores different concepts relating to the area of study. The study takes into consideration different research methods and re-references any standard text within this field.

The methodology involves an extensive literature review. It aims at understanding the research problem by analysing the local and international nuclear power regimes. The Methodology involves the study of already existing literature about nuclear power and its

²⁵Denscombe, M (1998). *The Good Research Guide* (Open University Press) at p. 215.

²⁶ Strauss, A & Corbin, J. (1990). *Basics of Qualitative Research: Grounded Theory Procedures and Techniques* (Sage).

²⁷ Ibid, at p.23.

importance in international development. Here, nuclear power regulations within the UAE and other developing and developed nations are reviewed. The implementation of these regulations is also taken into consideration through the review of existing books, articles and journals on the subject. The researcher also concentrates on the results so far achieved in the implementation of the policy of the UAE on nuclear energy.

The approach analyses the opinions of the people and experts using a prepared questionnaire (see Appendix 1) which was approved by the research supervisory team (see Appendix 2); based on their knowledge of the areas under investigation. Hence, it is useful for identifying issues pertaining to developing a standard nuclear liability framework for the UAE. Only when the data has been collected and analysed, may the aim of the research be determined. This is because the aim of the research tends to develop alongside the research process.

1.9 Data collection

Primary data were collected through face to face interviews with experts in the field using prepared and approved questions (see Appendix 1). Reports of various agencies within the UAE and other countries were consulted as secondary data. Secondary sources are those sources which are not first hand and are historical in nature. This method is usually followed in research when the interview method becomes practically impossible. The details of policies on the nuclear power projects are available in government reports. It is also necessary to access secondary data regarding the usage of power in the country. Such data can be collected from the reports of the governmental agencies, journals, articles and reports. The interview method considered for this research is limited when compared to the secondary sources.

The secondary data collection for this work has some limitations. While several secondary data regarding nuclear law are available, most of them are not specifically on UAE, or there is a lack of in-depth analysis of issues. However, this could be overcome by undertaking a comparative study on other developing nations as well as an in-depth analysis of the available primary data.

In this research, the need for using nuclear energy for non-violent purposes is discussed while focusing on the UAE. The research makes use of the existing literature on the subject. It deals with the growing demand for energy in the Middle Eastern countries, especially the UAE.

While primary sources, such as structured interviews, are used to analyse certain parts of the research, emphasis is also placed upon secondary sources of literature. The opinions and conclusions in these secondary sources are analysed before adopting it to the research thesis. The authors' viewpoints are not taken as they appear, but their ideas are analysed individually to highlight their applicability as per the requirements of the researcher.

Questionnaire was used because it was orderly prepared and presented and includes all the necessary information required to garner informed decisions. Those interviewed included very important and experienced officers from the Federal Authority for Nuclear Regulation (FANR) and Emirates Nuclear Energy Corporation (ENEC) directly involved in the development of the UAE's nuclear programme (see Appendix 2b for Recommendation Letter from the Chief Scientist at FANR). The data gathered was used to analyse and evaluate the area of study.

Although there was an element of interviewing during the study, the research was partly desk-based in nature and mainly considered analysis of legal and strategic policies regarding nuclear energy. Case studies and interviews were used to test reactions to emerging conclusions. Critical analysis of main factors and issues pertaining to questions of liability (both civil and state) was carried out.

In order to ensure the reliability and validity of their findings in this research, Saunders et al (2009) suggest that it is better to use a mixture of approaches, as this enables researchers to triangulate the data collected.²⁸ Data triangulation, according to Cameron and Price (2009), enables the researcher to increase internal validity and reliability by seeking secondary or tertiary sources to support the findings of any part of the study.²⁹ This enables the evaluation of the research result with existing secondary data.

²⁸ Saunders, M., Lewis, P. and Thornhill, A. (2009). *Research Methods for Business Students*, Prentice Hall.

²⁹ Cameron, S. & Price, D. (2009). *Business Research Methods: A practical approach*, CIPD.

1.10 Addressing the research objectives

To effectively conduct the research, the following methodology was adopted to consider the objectives of this study:

- i. To review literature on issues pertaining to the UAE nuclear energy development and evaluate state liability for nuclear accidents. To attempt this objective, a critical review of existing literatures which are related to the UAE, to nuclear energy programmes and to the nature of national and international legal and regulatory processes regarding nuclear power production, is required. This establishes the nature of existing liability frameworks and provides clear guidance for the adoption by the UAE of its own system for liability protections. Thus, coverage relates to international frameworks (example the UN Conventions), national frameworks (for example, the UAE nuclear Energy Acts Nos. 4 and 6) and regional frameworks (for example, trans-boundary incidents mechanisms).
- ii. To evaluate the operator's liability for nuclear emissions under the civil law for accidental damage. To perform this, the researcher evaluates the potential legal liabilities facing the UAE in its development of a peaceful nuclear energy programme. The work reviews relevant international and national legislations and case studies, to provide an analysis of identified concerns. The researcher evaluates State liability for nuclear accident and pollution trans-boundary incidents, potential liabilities for 'orphan sites' and operators' liabilities for emissions under civil laws. The research considers the nature and impacts of recent nuclear-based disasters, for example, the case studies of Chernobyl, Fukushima, Three Mile Island and Windscale nuclear incidents, to clarify potential liability issues and identify likely defendants' issues pertaining to liability.

The research also considers analysis of the nature and scope of existing nuclear energy laws in the UAE and those of the international community, to determine possible flaws and opportunities for review of liabilities concerns for relevant parties. The researcher engaged in primary data collection through structured

interviews with scholars and experts in nuclear energy, to measure findings and gain an insight into the nuclear power development and production issues regarding the UAE. This involved selected national and international bodies, agencies and commissions like the UAE government, UK Environmental and Nuclear Agency, United Nations Atomic Energy Agency. The interviews identify areas of best practice and relate them to the legal liability structures within the UAE.

- iii. To evaluate liability for orphan sites, characterise the state and civil law for accidental damage and to make recommendations on how the law can be used to determine issues regarding state and civil liabilities in nuclear power production in the UAE. For this objective, the researcher critically evaluates the research findings or results of investigation with specific reference to the UAE government policies concerning the development of peaceful nuclear energy. The study therefore makes recommendations as to who will be liable for nuclear accidents or hazards associated with substandard performances. These recommendations also cover issues regarding policies of the UAE government and their implications to state and operator's liability.

It is important to mention here that this research was conducted in line with the Southampton Solent University (SSU) Ethical Policy.

1.11 Research participants

As mentioned previously, ethical policies were fully considered during the execution of this study. For this reason, participants in the research are treated anonymously.

The participants in the research were mostly people who have been engaged in nuclear energy development in the UAE and thus provided a degree of expertise in the field. A total of ten (10) people were interviewed. They include lawyers, senior officials and directors of nuclear associations as well as those of the companies carrying out nuclear energy projects in the country. The interviewees were contacted because they have wider knowledge regarding nuclear power programmes and projects. Interviewees were identified through making contacts with relevant authorities (FANR and ENEC). For the

purpose of this research and in line with the ethics policy governing it, the issue of anonymity of the participant(s) is well maintained. However, to ascertain the validity and indebtedness of the information collated during the interview, it is worthwhile describing the extent of the technical know-how of key officials directly involved in the UAE nuclear energy development, next.

Three of the officials responded to legal and liability questions, three responded to political questions, two for the economic and two for the safety, security and environmental questions. Officials A, B and C work with FANR and have experience in legal issues regarding nuclear power programmes. Officials D, E and F are coordinators between departments of government (FANR and ENEC) and have experience in international relations. While officials G and H work in the economic department and have links with FANR and ENEC, officials I and J work with FANR and ENEC respectively and both work in the safety and security departments.

1.12 Research limitations

Research limitations basically present the discussions about the variables that impact a research but are beyond the control of the researcher. This research presents some limitations. The researcher admits that at present, there is very limited research in the field of nuclear law focussing on the Middle Eastern states. This is because nuclear energy and liability laws are very new to the UAE as well as the Middle East.

The UAE nuclear laws No. 6 of 2009 on Nuclear Energy law and No. 4 of 2012 on nuclear liability have not yet been tested or enforced because the nuclear power plants are currently being built and will be commissioned in 2017. For this reason, the efficacies of these laws are yet to be determined, since no incident has occurred.

The insufficiency of research materials (including articles, books and studies) on nuclear energy law, which investigate the subject area in the UAE and the Middle East region, has made it impossible for in-depth study to be ensured. Therefore, to compensate this, the researcher has used the structured interviews with identified experts in the developing process. This enhances the importance of the interviews and the relevancy of including Chapter Six in the thesis.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction to Chapter Two

Chapter Two of the thesis has a few objectives. Initially, it considers the literature review for the study. It provides a detailed study of the UAE's nuclear energy programme and defines the area of study. It reviews the conceptual frameworks covered in the research. The chapter also discusses the ethical reasoning behind the use of nuclear resources, as well as issues regarding nuclear liability. The development of international and domestic nuclear regimes regarding nuclear liability is also evaluated. This chapter also considers emerging facts and criticisms concerning nuclear power generation and analyses nuclear renaissance as an important aspect of the study. It also analyses milestones for nuclear power infrastructure development.

The civil nuclear industry has seen many ups and downs during its alternating phases of development and decline. With the end of the Second World War, the nuclear industry grew under the conception that mankind should draw benefits by converting a destructive military technology into a peaceful one. By the 1970s, it was a general perception that nuclear energy is a source of abundant power that can be generated in an environmentally friendly manner at very economical cost. With technology, largely in the hands of a few advanced and wealthy nations, there was minimal government interference and public scrutiny. These favourable conditions attracted many countries to start considering the establishment of nuclear plants for the peaceful utilisation of nuclear energy³⁰.

However, major problems arose during the 1970s, with increasing public scepticism about the safety of nuclear reactors, overall stagnation in the demand for electricity and the Three Mile Island accident (1979) in Pennsylvania. This led to the ending of any initial euphoria and brought the dangers surrounding nuclear energy into the limelight. The fall in prices of natural gas and the increasing technical costs of establishing nuclear plants

³⁰Lehtonen, Markku and Martiskainen, Mari (2015). Nuclear power after Fukushima: prospects and implications. In: Ekins, Paul, Bradshaw, Mike and Watson, Jim (eds.) *Global energy: issues, potentials, and policy implications*. Oxford University Press, Oxford, pp. 306-330.

further led to downscaling of investments in nuclear programs. Public sentiments soon turned against nuclear technology. People started criticising it for being incompatible with democratic ideology because of secrecy and centralisation of nuclear technology. Nuclear institutions which were once considered as world saviours were being portrayed as remote and powerful bureaucracies. All these factors had an adverse impact on the future of nuclear plants worldwide³¹. In addition, the world has seen the rise of environmental protectionism, which has placed nuclear energy production under scrutiny.

Momentum for nuclear programmes got strengthened again in the mid-1980s. With memories of Three Mile Island fading and economic growth picking up, many countries started considering new nuclear plants once again. Unfortunately, the Chernobyl accident in 1986 put an end to aggressive nuclear planning. The accident once again undermined public opinion regarding nuclear technology. It prompted improvements in reactor technologies, safety controls and brought more transparency to the operation of nuclear plants. The Fukushima accident in Japan, caused by a massive tsunami and earthquake on March 11, 2011, has led to a renewed focus on nuclear safety. The Fukushima accident posed questions about the amount of cross border liability and the exclusion of suppliers and contractors from any liability. In the aftermath of this incident, the international community is now actively considering new models of nuclear liability³².

2.2 International and regional organisations in Nuclear Law

2.2.1 The International Atomic Energy Agency (IAEA)

The IAEA was established in 1957 as an autonomous intergovernmental organisation through a multilateral treaty. It enjoys a special status in the United Nations system. The UN General Assembly has recognised IAEA's leading position in the field of peaceful utilisation of nuclear energy³³. The objective of IAEA is to ensure the development and implementation of nuclear infrastructure that supports successful introduction of safe and

³¹Ibid.

³²Report on "International Law and Nuclear Liability", American Academy of Arts & Sciences, Retrieved from: <https://www.amacad.org/content/publications/pubContent.aspx?d=1507>, (Accessed April 11, 2016).

³³Prevor, O. J. (2010), "The Normative Role of the International Atomic Energy Agency (IAEA), Legal Basis and Legal Sources", in International Nuclear Law: History, Evolution and Outlook, Nuclear Energy Agency, OECD.

secure nuclear power. Another primary objective of the Agency is to accelerate and enlarge the contributions of atomic energy towards peace, health and prosperity in the entire world. The activities of the Agency are now mainly concerned with nuclear safety and security, nuclear science and technology and nuclear techniques for development and safeguarding environment³⁴. The Treaties and legal frameworks etc., developed by IAEA are discussed later in the thesis.

2.2.2 The European Atomic Energy Community (EAEC)

Nuclear energy is estimated to account for almost 30% of all the electricity production in Europe³⁵. It was once considered as a vital factor in ensuring self-sufficiency in terms of European energy requirements. To support the development of a coherent, competitive, secure and sustainable energy policy, the European Atomic Energy Community (EAEC) was established in 1957 based on a treaty (Euratom)³⁶. Euratom is aimed at creating a common market across Europe for nuclear ores and fuel. It promotes research and dissemination of technical know-how of nuclear information. It is also actively involved in the establishment of uniform safety standards and facilitating investments in the development of nuclear energy³⁷.

³⁴Ibid.

³⁵Heffron, R. (2009), "Identifying How Legislation and Regulation Impact Upon the Conditions for New Nuclear Build in the European Union", Proceedings of the International Conference Nuclear Energy for New Europe 2009, Bled, Slovenia.

³⁶The Euratom Treaty was signed on 25 March, 1957 at the same time as the Treaty establishing the European Economic Community (EEC Treaty). The Treaty is less well-known due to the lower profile of the organisation it founded. While the EEC has evolved into what is now the European Union, Euratom has remained much the same as it was in 1957, albeit governed by the institutions of the European Union. It was established with its own independent institutions. The Euratom treaty has seen very little amendment due to the later sensitivity surrounding nuclear power amongst European public opinion. Because of this, some argue that it has become too out-dated, particularly in the areas of democratic oversight. It was not included as part of the Treaty establishing a Constitution for Europe, which sought to combine all previous treaties, over fears that including nuclear power in the treaty would turn more people against it. It is therefore still in force today but as a separate legal treaty. It forms part of the active treaties of the European Union. The objectives of the Euratom Treaty are to:

- contribute to the formation and development of Europe's nuclear industry, so that all Member States can benefit from nuclear energy
- enhance security of energy supply
- guarantee high standards of safety for the public and workers
- ensure that nuclear materials are not diverted from civil to military use⁷.

See: European Institutions (2007). 50 years of the Euratom Treaty: reflecting on the past, safeguarding the future. Issue No.16 Spring (2007). [Online]. Available at: <https://www.euronuclear.org/e-news/e-news-16/euratom-treaty.htm> Accessed on 28/07/2016.

³⁷ Ibid.

This treaty has shown tremendous resilience in form and over the years it has remained mostly unaltered and unchanged. It survived the impact of the 1970s' oil price crisis and the 1986 Chernobyl disaster. Time and again some attempts were made to change or amend the treaty but these have largely remained unsuccessful. In 1977 Euratom Loans were introduced to finance the establishment of nuclear power stations. However, they were subsequently scrapped in the 1980s due to the failure of the Loans system. The treaty has also survived the criticism of a lack of democracy in decision making processes. The European Economic and Social Committee (EESC) and the Scientific and Technical Committee created under the provisions of Euratom Treaty each have a member nominated by national governments. These committees perform a role like the process of consultation followed in European Parliament³⁸.

2.3 Development of the International Civil Nuclear Liability Regimes

The purpose of international law is to deal with apprehension relating to the non-peaceful use of nuclear energy, nuclear security, nuclear safety and the potential trans-boundary consequences of nuclear accidents relating to civilian nuclear power reactors³⁹. Nuclear accidents have low risk of occurrence, but do have the potential of causing major damage that will trigger large claims for compensation. Such claims may require complex evidentiary proof because many health effects of radiation exposure manifest themselves after a considerable time gap following an incident. It is due to these and other reasons, that the international community realised traditional laws were grossly inadequate to handle claims arising from a nuclear accident⁴⁰.

In the early 1950s, most of the Western nations recognised the fact that the consequences of a nuclear accident will not remain confined to the boundaries of one nation only. The Brookhaven Report⁴¹ published in 1957 by the Atomic Energy Commission of the United

³⁸ Ibid.

³⁹ Cook, Helen (2014). *International Nuclear Law: Nuclear Safety, Emergency Response and Nuclear Liability*. Springer Berlin Heidelberg: London. Pp 279-296.

⁴⁰ Stoiber, C., Cherf, A., Tonhauser, W. and Carmona, M. D. L. V. (2010), "Handbook on Nuclear Law: Implementing Legislation", International Atomic Energy Agency, Vienna.

⁴¹ WASH-740, The Brookhaven Report also known as "Theoretical Possibilities and Consequences of Major Accidents in Large Nuclear Power Plants" estimated maximum possible damage from a meltdown with no containment building at a large nuclear reactor. The report was published by the U.S. Atomic Energy Commission (USAEC) in 1957. The conclusions of this study estimated the possible effects

States, provided detailed estimates of various damages that may be caused by a nuclear accident, such as loss of life, injuries, health hazards and so on. Based on the findings of this report and realising the trans-border effects of nuclear accidents, the international community decided to establish an international nuclear regime to compensate victims for losses and damages⁴².

Following the Brookhaven Report, two separate nuclear liability regimes were created. The first regime, the Convention on Third Party Liability in the Field of Nuclear Energy, referred to as the 1960 Paris Convention, was signed by 15 Western European Nations. This Convention fixed the operator's liability for the damage caused by their activity and specified the competent court and law which would be applied in case of a nuclear accident. The Paris Convention was adopted under the auspices of the then Organisation for European Economic Co-operation (OEEC), which was later reconstituted as the Organisation for Economic Co-operation and Development (OECD), but it had not yet entered into force at the time when the Vienna Convention was adopted⁴³. The International Atomic Energy Agency (IAEA) adopted a nuclear regime called the Vienna Convention on Civil Liability for Nuclear Damage in 1963. This Convention was signed by 30 countries mainly from Eastern Europe, South America, Africa and the Pacific.

Both the Paris Convention and the Vienna Convention were supposed to create, in the national law of their respective Member States, a unique legal regime for nuclear liability derogating from the otherwise applicable rules governing third party liability⁴⁴.

of a "maximum credible accident" for nuclear reactors then envisioned as being 3400 deaths, 43,000 injuries and property damage of \$7 billion (\$57bn adjusted for inflation in 2012 since 1957). The estimate of probability was one in a hundred thousand to one in a billion per reactor-year. When WASH-740 was revised in 1964-65 to account for the larger reactors then being designed, the new figures indicated that there could be as many as 45,000 deaths, 100,000 injuries, and \$17 billion in property damage (\$125bn adjusted for inflation since 1964). However; the assumptions underlying the results were unrealistic (including the worst meteorological conditions, no containment building, and that half the reactor core is released into the atmosphere as micrometre-sized pellets without any examination of how this might occur). These were due to conservatism (estimating the maximum possible damage) and the need to use atomic bomb fallout data, which had been collected from tests (computers in 1955 being greatly insufficient to do the calculations).

⁴² Khan, S. (2015), "International Civil Nuclear Liability Regime and India: A Comparative Assessment", International Strategic and Security Study Programme, NIAS, India. Retrieved from: <http://issssp.in/internationalcivilnuclearliabilityregimeandindiaacomparativeassessment/print/> (Accessed April 01, 2016).

⁴³ International Atomic Energy Agency (2013). The 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention - Explanatory Text. *The existence of two distinct international treaty regimes on civil liability for nuclear damage*. IAEA International Law Series No. 5. Vienna: IAEA. Pp. 1-2.

⁴⁴ See: International Atomic Energy Agency (2013). The 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention - Explanatory Text.

The researcher notes that the Vienna Convention has been ratified by more Member States, including the UAE. The country makes its nuclear laws in consonant with the provisions of the Vienna Convention. The UAE has also made its laws, ratifying the Protocol to amend the Vienna Convention as well as the 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention⁴⁵. The Joint Protocol was reached as a means of settling the differences between the Paris and the Vienna Conventions and harmonising them. The Joint Protocol contains robust provisions regarding third party or civil liability for nuclear damage.

The researcher observes that the differences in the signatories and ranges of coverage of the Paris and the Vienna Conventions do not overly suggest that there are different rules for Western Europe and other parts of the world. It should be understood that the underlying fundamentals of these Conventions are geared towards acceptable standards and good practice. Irrespective of whether nuclear laws are made to cover specific political and economic regions, or individual Member States, or promulgated to reflect global perspective, the essence of the law is to ensure fairness and orderliness. The UAE, having adopted the set standards, should therefore work towards the ingenuity of its nuclear power programme.

These Paris and Vienna Conventions were based on four pillars of a limited liability scheme. The first pillar is the ‘no fault scheme’ which means that no proof of fault or negligence is required to hold the nuclear installation’s operator responsible for a nuclear accident. Second, the liability of the operator would be absolute for nuclear accidents occurring at the installation site or during transport of nuclear material to or from the site. Third, as per these Conventions, the liability and time for instituting damage claims will be limited. And lastly, the operator would be required to secure insurance and other financial guarantee up to the amount of its liabilities⁴⁶. The researcher views that it is possible that these four pillars can create a substantive and fair system for dealing with matters pertaining to liability and potential compensations for harm. In theory, the limited

⁴⁵Federal Decree No. 32 of 2012 Ratifying the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage of 1997; and Federal Decree No. 33 of 2012 Ratifying the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention of 1988.

⁴⁶“International Nuclear Liability Regime”, World Nuclear Transport Institute; Retrieved from: www.wnti.co.uk/media/13831/8.pdf, (Accessed on April 02, 2016).

liability scheme considering the four pillars can be justifiably implemented but again it depends if in practice, the provisions are enforced accordingly.

The Chernobyl accident (1986) in the former Soviet Union released massive amounts of radioactive materials into the atmosphere. These harmful materials spread across various neighbouring countries including Belarus, Ukraine and the UK. The accident proved that a nuclear disaster knows no geographical boundaries. It can affect any nation or region irrespective of the fact of whether that nation is a part of any limited liability regime or not⁴⁷.

As a subsequent result of this accident, the need for having a unified approach for dealing with nuclear disasters was felt to be an urgent necessity. To synergise international efforts for tackling nuclear disasters, a Joint Protocol was signed in 1988. In this protocol a common ground was developed between the Vienna Convention and the Paris Convention. This protocol mutually extends the benefits of the special regime of civil liability for nuclear damage to the contracting parties. It eliminates the possible conflicts that may arise from the simultaneous application of both Paris and Vienna Conventions to a nuclear accident. The Joint Protocol currently has 26 parties, comprising of 16 State parties, to the Vienna Convention and 10 State parties to the Paris Convention⁴⁸. Later, the Vienna Convention was amended in 1997 and the Paris Convention in 2004 to remove the discrepancies in their implementation in terms of liability amounts, scope of application and rules of jurisdiction conflicts⁴⁹.

The Convention on Supplementary Compensation for Nuclear Damage (CSC), concluded under the auspices of International Atomic Energy Agency (IAEA) was adopted in 1997. It was aimed at providing a worldwide liability regime and to supplement the funds required for funding the liability⁵⁰. It was open to all parties of either the Paris Convention (1960) or Vienna Convention (1963). It was also open to those parties which were not part of either the Paris or Vienna Conventions, but were having domestic legislation in place consistent with the principles embodied in those Conventions⁵¹.

⁴⁷ Khan, S. (2015), Op Cit.

⁴⁸Stoiber et al., (2010), Op cit.

⁴⁹ Khan, S. (2015), Op Cit.

⁵⁰ Ibid.

⁵¹Stoiber et al., (2010), Op cit.

The most important principles of the present international regime for civil liability for nuclear damage are⁵²:

- A defined scope for liability regime based on well-designed concepts of nuclear installation, operation, nuclear incident and nuclear damage: here, a wider coverage of all issues pertaining to nuclear power generation is enhanced;
- The operation of nuclear installations bearing strict (no fault) liability;
- Exclusive liability of the operator that would imply that parties other than the operator would be exonerated from any liability;
- Exoneration of operator from any liability in case of extraordinary circumstances such as a nuclear accident caused by warlike events, grave natural disasters, or gross negligence of the person who suffers nuclear damage: in any of these situations, the operator cannot be held responsible since the cause(s) are not his;
- Possibility of limiting the liability amount: it is possible that Member States can place limits on the amount to be paid to the victims as liability;
- Mandatory financial security of the operator to meet the liability: it is mandatory that operators obtain adequate insurance coverage that can be used to pay off compensations when an incident occurs;
- Limitation of liability in time;
- Non-discrimination and equal treatment to all the victims irrespective of their nationality, caste, creed, religion or ethnicity: here, every victim is accorded unbiased treatment;
- Exclusive jurisdiction of a single competent court: here only a competent court of jurisdiction is entitled to entertain cases pertaining to nuclear incidents; and
- Obligation to recognise and implement the judgment of a competent court in other contracting nations, without re-examining the merits of the judgment: in this situation, all Member States are mandated to uphold the final judgement of a competent court held in any Member State.

⁵² Ibid.

2.3.1 Emerging trend in Nuclear Liability Regime

Historically, the liability for a nuclear accident rests with the operator of the nuclear facility. Traditionally, the operators of nuclear plants have been entrusted with the responsibility of ensuring the quality and safety of products and services being offered or rendered. Subsequently, no emphasis was given to the liabilities and duties of the suppliers in any major international or national law. The only two conditions in which recourse could be claimed against a supplier were: (a) if a nuclear incident occurred due to the intentional act of omission or commission committed by the nuclear supplier, or (b) a contractual right to recourse exists⁵³.

This condition of almost no liability of suppliers remained in force for a considerable period and was even codified in the Convention on Third Party Liability in the Field of Nuclear Energy (1960), the Vienna Convention on Civil Liability for Nuclear Damage (1997, as amended) and the Convention on Supplementary Compensation for Nuclear Damages (1997)⁵⁴. With this kind of codification, it became the norm in nuclear energy generation that the nations opting for nuclear energy generation complied with this condition. As previously stated, the researcher still believes that it is a good thing to set out these codifications to ensure good practice in the nuclear industry, but what is important is how the codifications are practiced and enforced. The UAE has promulgated its nuclear laws based on these codifications. It is possible that the provisions would be adhered to by the country when the nuclear plants are eventually used.

For the first time the supplier liability was introduced in the Civil Liability for Nuclear Damage Act, 2010 (CLNDA) passed by the Indian Parliament. This Act incorporated a clause for supplier liability in case of a nuclear accident which would be over and above the principal liability borne by the operator. Section 17(b) of the Act states that:

⁵³ Abraham, M. (2014), "Nuclear Liability: A Key Component of the Public Policy Decision to Deploy Nuclear Energy in Southeast Asia", Cambridge: American Academy of Arts and Sciences, Retrieved from: <http://www.amacad.org/gnf> (accessed April 02, 2016)

⁵⁴ Ibid.

“The operator of a nuclear installation shall have a right of recourse where the nuclear incident has resulted from the wilful act or gross negligence on the part of the supplier of the material, equipment or services, or of his employee”⁵⁵.

Initially there were apprehensions that this provision for supplier liability would be strongly opposed by prominent supplier countries such as the United States, Japan, France and Russia. Recent reports have suggested that Russia has already entered a preliminary agreement with India for supplying nuclear material. France is also becoming inclined towards dealing with India because of lucrative financial benefits that are associated with supplying a growing economy as in India⁵⁶.

2.4 Nuclear Renaissance

There is an increasing concern for global climate change as well as the realisation that mankind needs to reduce emissions from the burning of fossil fuels, such as coal, oil and gas; hence these factors are essential to the renewed interest in nuclear power⁵⁷. According to the World Nuclear Association, nuclear renaissance has been used since 2001 to refer to possible resurgence in the nuclear industry motivated by the rise in prices of fossil fuels as well as concerns about meeting the limits of greenhouse emissions⁵⁸. It has been reported that the generation of electricity from nuclear sources in 2012 was the lowest since 1999; ascribed to the fact that more nuclear reactors have been closed than opened in recent times⁵⁹.

Various factors capable of inhibiting nuclear renaissance have been identified. While the occurrence of more nuclear accidents, security and nuclear weapons proliferation are major factors, trade restrictions and lack of workforce in the nuclear sector, adverse economics in contrast to other sources of energy, the controversial issue of how nuclear waste or spent nuclear fuel can be reused and delay in tackle climate change are also

⁵⁵Balachandra, G. (2010), “The Civil Nuclear Liability Bill”, IDSA Brief No. 26, Institute for Defense Studies and Analysis, New Delhi

⁵⁶ Abraham, M. (2014), Op Cit.

⁵⁷ Nuttall, William J. (2004). Nuclear Renaissance: Technologies and Policies for the Future of Nuclear Power. CRC Press – Taylor & Francis Group: Oxon. Page 1.

⁵⁸ World Nuclear Association (WNA), (2013). “Nuclear power down in 2012”. *World Nuclear News*. (20 June 2013).

⁵⁹The Economist, (November 11, 2013). “Difference Engine: The nuke that might have been”. The Economist Group, London.

considered to hindering nuclear renaissance⁶⁰. The researcher maintains that this change in nuclear energy production clearly opposes the main purpose of nuclear renaissance which include the need for an economic source of electricity that is continuous and reliable on a large scale which reduces dependence on overseas imports of fossil fuels. Others are increasing energy demand, increased awareness about climate change, cost effectiveness and grid stability. According to the International Energy Agency (IEA):

“A nuclear renaissance is possible but cannot occur overnight. Nuclear projects face significant hurdles, including extended construction periods and related risks, long licensing processes and manpower shortages, plus long-standing issues related to waste disposal, proliferation and local opposition. The financing of new nuclear power plants, especially in liberalised markets, has always been difficult and the financial crisis seems almost certain to have made it even more so. The huge capital requirements, combined with risks of cost overruns and regulatory uncertainties, make investors and lenders very cautious, even when demand growth is robust.”⁶¹

The above points suggest therefore that a nuclear renaissance is not clearly present, or at least faces major hurdles. The researcher believes that it is possible the UAE can overcome the significant hurdles discussed above by the IEA, by instituting vigorous plans for its nuclear energy programme and ensuring that such plans are extensively implemented. The country is more positive about its strategies and does not seem to be weighed down by such uncertainties.

The halt in nuclear renaissance is assumed to be mainly attributed to the March 2011 nuclear disasters in Fukushima and the shutdowns of other nuclear facilities across the world⁶². According to Platts (2011), the crisis at Japan’s Fukushima nuclear plants has prompted leading energy-consuming countries to review the safety of their existing reactors and cast doubt on the speed and scale of planned expansions around the world⁶³.

⁶⁰Trevor Findlay, (2010). The Future of Nuclear Energy to 2030 and its Implications for Safety, Security and Nonproliferation. An Overview. February 4, 2010. Centre for International Governance Innovation (CIGI), Canada, pp13-21.

⁶¹International Energy Agency, (2009). *World Energy Outlook*. International Energy Agency (IEA), p. 160.

⁶²Bloomberg, (March 2011). Nuclear Renaissance Threatened as Japan’s Reactor Struggles. [Online]. Available at: <https://fukushimanewsresearch.wordpress.com/2011/03/13/31/> Accessed on March 10, 2011.

⁶³Platts, (2011) “News Analysis: Japan crisis puts global nuclear expansion in doubt. Platts. 21 March 2011.

The ever-increasing electricity generation gap, the dwindling fossil fuels supplies and impending climate change are the factors that have led the world to search for clean and efficient alternative sources of energy. Nuclear power is one of the best alternative sources of energy available to the world. Many countries around the world are now developing or considering building new nuclear power plants. This new build-up activity is termed as “nuclear renaissance”⁶⁴. The present nuclear capacity is around 373 GWe. It is expected to be between 1100 and 3500 GWe by 2060, subject to political support and the level of priority. Most of this increase is expected in those countries which already have nuclear plants and this goes a long way to debut the IEA quote referenced above⁶⁵.

Apart from Germany, most of the Western European nations, including France, the UK and Russia, have announced their plans of increasing nuclear power generation. One of the key drivers in some of these countries is the gradual phase out of the existing nuclear reactors. Old nuclear reactors are required to be decommissioned as they are no longer technically and economically viable. For example, the Oldbury and Wylfa plants in the UK were recently shutdown because they use Magnox fuel, production of which has ceased⁶⁶. The closed units are expected to be replaced with new higher capacity units in coming years. The researcher observes that this raises questions of potential liabilities associated with the decommissioning process itself. Thus, the need for clear legal regulation exists even after the life-span of a nuclear plant and the UAE is aware of this.

The two main drivers for nuclear power are climate change and energy security⁶⁷. The expected increase in nuclear energy generation is a general commitment of national governments to reduce carbon emissions in response to massive climatic changes. This requires less and less dependence on carbon technologies, particularly in power generation. Limiting the use of fossil fuels in power generation enhances the case for more reliance on nuclear power. Nuclear power is a relatively clean fuel and helps in meeting the challenge of climate change.

⁶⁴Goodfellow, M. J., Willaims, H. R. and Azapagic, A. (2011), “Nuclear Renaissance, Public Perception and Design Criteria: An Exploratory Review”, *Energy Policy*, Vol. 39, pp. 6199-6210.

⁶⁵ World Nuclear Association (2010), “The WNA Nuclear Century Outlook: Averting the Danger of Catastrophic Climate Change: Is the Nuclear Renaissance Essential?”

⁶⁶Goodfellow et al., (2011), *Op Cit*.

⁶⁷Greenhalgh, C. and Azapagic, A. (2009), “Review of Drivers and Barriers for Nuclear Power in the UK”, *Environmental Science and Policy*, Vol. 12, pp. 1052-1067.

The ever-growing energy demand has resulted in the need to put in place an energy security regime. This is possible within the increasing development and use of nuclear power. Presently, international cooperation on nuclear science and technology sharing has increased rapidly. The nuclear capacity has increased in Eastern Europe and Asia⁶⁸. The recent surge in nuclear capacity is because of global population growth. The industrial development taking place in developed and developing economies is expected to double the energy consumption from 2007 level by 2030⁶⁹. The researcher therefore suggests that the UAE allows for long term objectives or gains for operators. The increasing disruptions in supplies, geo-political instabilities and the ever-increasing oil prices have forced the world economies to take energy security as an extremely serious issue⁷⁰. These factors are major contributors towards a shift in international perception regarding the need for having a nuclear renaissance.

The process of nuclear renaissance will occur in two phases⁷¹. In the first phase, the process will include major replacements and extensions in the life of existing nuclear plants. The focus during this phase would be on improving the efficiency and reliability of nuclear electricity production which has already been proposed by the UAE.

The second phase will start after 2030, which will be marked by large scale production of nuclear energy in the UAE as an alternative to fossil fuel based electricity production. Decarbonisation of electricity production requires two main challenges to be surmounted. Firstly, nuclear plants should be established in all parts of the world without increasing the growth of nuclear weapon technologies and this suggests that nuclear is a viable alternative to carbon-based fuels. Secondly, a worldwide system of safe disposal of nuclear waste should be developed. A detailed assessment of risks associated with transport, storage and disposal of nuclear waste is to be carried out⁷². These suggestions should be considered by the IAEA as a global body controlling nuclear energy

⁶⁸ Henderson, H. (2014), *Nuclear Power - A Reference Handbook*, Second Edition, ABC-CLIO: California.

⁶⁹ Ibid.

⁷⁰ Greenhalgh, C. and Azapagic, A. (2009), *Op Cit*.

⁷¹ Grimes, R. W. and Nuttall, W. J. (2010), "Generating the Option of Two Stage Nuclear Renaissance", *Science*, Vol. 329, pp.799-803.

⁷² Ibid.

developments. Member States should take on these observations. The researcher expects the UAE to take a lead on these.

2.4.1 Challenges for Nuclear Renaissance

The existing and future nuclear plants face multiple challenges. Some of the prominent current challenges include large cost overruns, long construction horizons, a history of poor initial performance at the time of commercial launch and unresolved disposition of high level waste⁷³. In addition, the uncertainties surrounding the climate change policies and effectiveness of evolving power technologies are also a contributing factor in the riskiness of nuclear power generation.

The consistency of nuclear supply chain issues is also a cause for concern. Presently, very few companies worldwide have retained the key capabilities to supply nuclear raw materials. Along with this, the nuclear skill set has also not been replenished in recent years. There is an acute shortage of expert personnel to manage and operate nuclear plants. The problem is more acute in the field of nuclear safety inspectors. The last two decades have witnessed closure of many nuclear radiation and reactor test facilities. This is again a serious cause of concern for future research and development in nuclear power generation in the UAE. Last but not the least, social factors comprising of public opinions about nuclear plants are also shaping policy decision making in the country⁷⁴. The researcher suggests that the UAE should consider training and retraining of its labour force in the field of nuclear energy production and embark on wider orientation of the public concerning its nuclear programme.

The issues that will emerge during the later stages of nuclear renaissance, say after 2030, would primarily be different than those being faced today. The prime concern in that period would be fuel availability. The present uranium fuel cycle will become unsustainable by 2060 and should be augmented by nuclear fuel reprocessing, innovative fuel cycles, or by gaining uranium from unconventional sources. In future, design considerations will also be more prominent than today. The future nuclear reactors should

⁷³ Holt, L., Sotkiewicz, P. and Berg, S. (2010), "Nuclear Power Expansion: Thinking about Uncertainty", *The Electricity Journal*, Vol. 23, Issue 05, pp.26-33

⁷⁴ Grimes, R. W. and Nuttall, W. J. (2010), *Op Cit*.

be built in such a manner that they should offer three-way choice between life extension, reactor replacement, or full decommissioning and rebuilt. The demand for national and international inspectors is going to increase soon. Most of the existing inspectors and safety officers are getting older, young engineers and inspectors will be required in future to continue their legacy⁷⁵.

2.5 Milestones for Nuclear Power Infrastructure Development

One of the most important projects that require a cautious scheduling, preparation and venture in time and human resources is the nuclear power programme. The handling of nuclear material itself is a major issue that requires strict procedures. For a Member State to decide to invest in a nuclear programme, such decisions should be based on an assurance of using nuclear power for peaceable purposes, in a safe and secure approach.

The Journey to nuclear power infrastructure development can be successfully attained through the consideration of 19 Milestones set out by the IAEA. These milestones include: Management, National Position, Regulatory Framework, Legislative Framework, Site and Supporting Facilities, Stakeholder Involvement, Nuclear Fuel Cycle, Environmental Protection, Procurement and Industrial Involvement. Others are Safeguards, Nuclear Safety, Electrical Grid, Radiation Protection, Emergency Planning, Human Resources Development, Radioactive Waste, Security and Physical Protection, Role of Government, Funding and Financing, Leadership/Commitment, Institution Building and Legal Framework and Rule of Law.⁷⁶ The researcher is of the view that the basis for successful nuclear energy production in the UAE should be determined by instigating sound legal frameworks as guides to the building and operation of the nuclear plants. Carrying the public along in every aspect of the programme as well as deliberating issues of environmental protection, safety and security and manpower development should be evaluated by the UAE.

The 19 milestones are further classified into four basic categories. These are:

- i. Milestones that are common to all (even fuel);

⁷⁵Ibid.

⁷⁶Murphy, P. M. (2007). International Atomic Energy Agency: Milestones for Nuclear Power Infrastructure Development. Opening Remarks - Finance. Vienna, Austria November 8, 2007

- ii. Those that are more precise to nuclear (even grid);
- iii. All impact investing as opposed to funding; and
- iv. Those that indicate the government's responsibility is persistent in all the milestones, but that there is an exceptional impact on funding.

The commitment to a nuclear power project therefore entails the establishment of a sustainable national infrastructure that offer governmental, regulatory, legal, technological, managerial, industrial and human support for the nuclear programme throughout its life sequence.⁷⁷ Essentially, the setting up of a responsible nuclear power programme is based upon the expression of conformity with global permissible mechanisms, internationally accepted nuclear safety standards, security guidelines and safeguards requirements. The improvement and execution of a suitable infrastructure to sustain the thriving commencement of nuclear power and its peaceful, safe, secure, and proficient application is a vital concern, particularly for countries that are allowing for and planning their initial nuclear power plant as is the UAE. The UAE will address these concerns by carefully implementing its robust policies and action plans.

The facilities required to maintain the operation of a nuclear power plant are extensive. These range from the substantial infrastructure and equipment related to the discharge of the electricity; the transportation of the material and supplies to the site; the site itself; and the facilities for managing the radioactive desecrate material, to the legal and regulatory structure in which all of the basic activities are carried out; and the human and economic resources needed to realise the required activities.⁷⁸ Basically, these must comprise all activities needed to set up and manage a nuclear programme and the UAE has taken this on board.

The researcher maintains that all stakeholders (decision makers, consultants and senior managers in governmental organisations, utilities, trade organisations and regulatory bodies) in countries opting to establish or expand their nuclear power programmes and even or exporting supplies for these plans should ensure that the national infrastructure needed is accessible. It is believed that the experience and good practices of countries

⁷⁷ International Atomic Energy Agency (IAEA), (2007). Milestones in the development of a national infrastructure for nuclear power. IAEA NUCLEAR ENERGY SERIES No. NG-G-3.1, Vienna: IAEA.

⁷⁸ See (IAEA), (2007).

with developed nuclear energy programmes can help shape the endeavours of new member states. The researcher is also of the view that the UAE is capable of facilitating efficiency in the expansion of a thriving state nuclear energy programme, if it pays proper early attention to all the milestones, while lack of proper awareness to any of the concerns may result in future difficulties that may drastically affect the successful introduction of nuclear power.

It is also expected that a Member State considering a nuclear power programme should have steady opinionated, cost-effective and social backgrounds to enable it thrive. Political steadiness is essential to draw the support of global organisations and commercial bodies, but such steadiness only does not promise that a power plant vendor can be established who agrees to construct a plant, or that funding will be set up for the nuclear power plant. It is indeed a major commitment to undertake a nuclear programme and this requires stringent interest to nuclear safety and the management of nuclear material. This is not only a responsibility to the citizens of the Member State, but also to the global community. The basis of nuclear safety is to protect people and the environment from the damaging effects of ionising radiation from nuclear materials. An all-inclusive security framework needs to be developed that infuses all improvement activities.⁷⁹

2.6 UAE's Nuclear Energy Programme: emerging facts and criticisms

This section deals with the details as well as positive and negative views of people concerning the UAE's nuclear power programme. The researcher maintains that it is helpful to provide a synopsis of how the UAE is managing the factors and requirements highlighted above, in the preceding section.

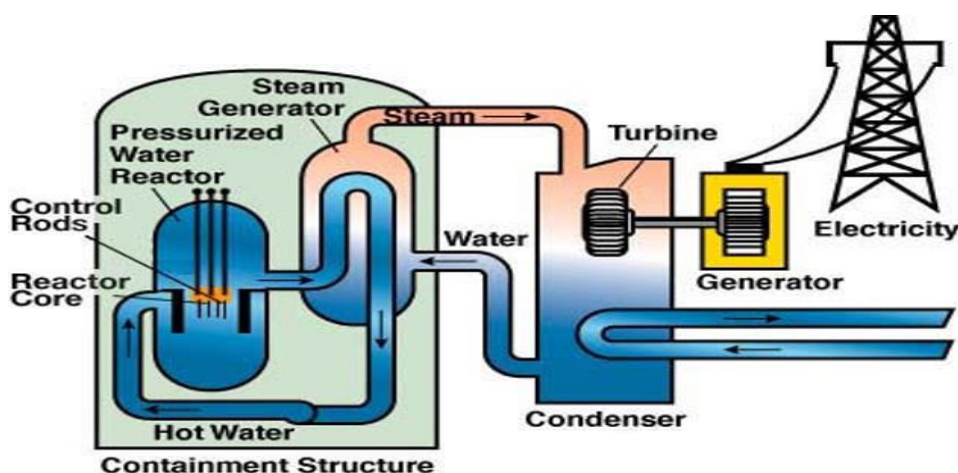
⁷⁹ One option for the development of this framework is to use the information found in the IAEA publication 'Fundamental Safety Principles', which contains ten safety principles that represent the international consensus on the high level of safety required for the sustainable use nuclear power. The first principle establishes that the ultimate responsibility for safety must rest with the operator. It is incumbent on the leadership and management of the Member State and the operator to develop awareness of safety issues and the encouragement and enforcement of a safety culture throughout the entire programme; (IAEA, 2007).

2.6.1 Emerging facts

This sub-section of the chapter looks at the analysis of those specifics regarding nuclear power production. The author believes that the awareness in these areas will help to highlight the potential risks and harms that may give rise to future legal liabilities for the various stakeholders.

According to the Nuclear Energy Institute (NEI), Nuclear Energy is a form of energy that originates from the splitting of uranium atoms in a process called Fission⁸⁰. Fission means ‘the splitting of something into two or more parts’. Nuclear fission therefore takes place at the power plant. Here, the fission process is used to generate heat for producing steam which is used by a turbine to generate electricity. This could be illustrated, in the Diagram 1 below.

Diagram 1: Nuclear reactor



Source: Afritopic Media (Afritopic.com)⁸¹

There has been an increased awareness regarding the potential of nuclear energy to meet the increasing global demand for electricity and several countries such as England, China and Finland have made use of nuclear power reactors for their energy supplies⁸². The Middle East and North African countries have been favouring the use of nuclear energy

⁸⁰Nuclear Energy Institute (NEI).

⁸¹Afritopic Media. Nuclear Reactor. [Online]: Available at: <http://afritopic.com/media/?tag=nuclear-reactor>. Accessed on 17/09/2014.

⁸² Dennis Kumet, (2011). ‘The Arab Region as Part of a Nuclear Renaissance: Outlooks and Alternatives’, Layla Al-Zubaidi, Joachim Paul, Doreen Khoury (eds.), ‘Nuclear energy and the Arab World’, Perspectives, Heinrich Boll Stiftung 1 April, 2011.

for the generation of electricity⁸³. The increase in the demand for energy all over the world is tremendous, due to the development of industries and economies.

The standards of living in all the countries have considerably increased and the intensified global commercial development has also contributed to the dramatic push in the need for power. To fully appreciate the importance of nuclear power in a striving economy like that of the UAE, it is important to look at structure and the socio-political and economic diversities of the country from the perspective of the need for such power production.

Abu Dhabi, Dubai, Sharjah, Ajman, Fujairah, Umm Al Qaywayn and Ras Al Khaymah, together form the UAE. Each emirate has its own ruler but the administration of the federation is made possible by the Federal Supreme Council formed by the group of rulers of all the seven emirates⁸⁴. The President of the UAE is elected from the council. Even though it is a federation of seven emirates, the comparatively richer Abu Dhabi and Dubai controls the administration of the federation in effect. The Supreme Council is bestowed with the power to assign the status of the Prime Minister and the ministerial status to persons⁸⁵. The Federal Supreme Council meeting is scheduled to meet four times annually to draft the guideline for governmental policies⁸⁶. The researcher notes that the Federal Supreme Council forms the decision makers in the UAE, thus it is important that they need to be aware of the risks and benefits in dealing with the developments of the nuclear programme. Therefore, the likelihood of the UAE making appropriate laws to deal with the issues that arise from nuclear power production can be assessed based on the sort of officials constituting the Council - those who understand and appreciate nuclear as a feasible alternative to fossil fuels.

With the growing demand for power, the UAE government explored various sources for generating enough electricity that would be sufficient to sustain its economic development. Among the options explored, burning of liquids (like crude oil and/or diesel) was found to be logistically viable but environmentally a disastrous proposition in

⁸³ Ibid. Dennis Kumetat (2011).

⁸⁴ Christopher Blanchard M. and Paul Kerr K., (2010). *The United Arab Emirates Nuclear Program and Proposed U.S. Nuclear Cooperation*, CRS 7-5700, December 20, 2010, Available at www.crs.gov Last accessed on 5-08-2012.

⁸⁵ Ibid. Dennis Kumetat.

⁸⁶ Kenneth Katzman, *the United Arab Emirates (UAE): Issues for U.S. Policy*, July 17, 2012, Available at www.crs.gov last accessed on 5-08-2012.

the long run. Heavy reliance on liquids for power generation would also entail extremely high economic costs. The option of investing in coal based power generation plants was also discarded because widespread use of coal throughout the UAE would have even more detrimental effects for the UAE's environment.

The renewable energy sources, like solar and wind, were environmentally friendly but even their aggressive deployment had the potential of meeting only 6-7% of peak electricity demand⁸⁷. Some of the main reasons why some of these sources of electricity are not going to be developed within UAE include inability to meet the huge energy need and cost effectiveness. As it stands currently, the UAE considers nuclear energy an acceptable way of meeting the country's projected energy demand (see Diagram 2, below). This is simply because nuclear energy can be produced on a large scale; it is cleaner and more economical.

Diagram 2: Projected Capacity and Energy Demand - UAE



Source: Emirates Nuclear Energy Corporation

⁸⁷ Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy, Emirates Nuclear Energy Corporation, Retrieved From: <https://www.enec.gov.ae/uploads/media/uae-peaceful-nuclear-energy-policy.pdf>, (Accessed on April 15, 2016).

In response to these drawbacks of liquid, coal and renewable sources of power generation, the government of the UAE evaluated meeting some of its energy requirements through nuclear energy. Intensely conscious of the particular situations and considerations around the establishment of nuclear reactors, the government endorsed the following policy statement for starting a peaceful civil nuclear energy programme⁸⁸:

- i. The UAE is dedicated to absolute operational clearness. Here, wider consultation is carried out with the local people and other stakeholders to brief them about the projects as well as gathering inputs to improve on the programme.
- ii. The country is committed to following the maximum values of non-proliferation. As previously stated, the researcher posits that the country ratifies the Non-Proliferation Treaty. This means that it will not use the projects for destructive, instead, for peaceful purposes.
- iii. The UAE is committed to the utmost principles of safety and security. The country will try and maintain good practice by ensuring that relevant legislative mechanisms are followed.
- iv. The UAE intends to operate staunchly with the IAEA and consider its standards in assessing and possibly establishing a peaceful nuclear energy agenda. The IAEA controls all nuclear power projects globally. Therefore, the guidance of this agency will go a long way to ensuring the success of the UAE's nuclear energy pursuit.
- v. The country expects to expand any peaceable domestic nuclear power potential in corporation with the governments and firms of liable nations, as well as the support of suitable skilled organisations. Here, UAE gains from the challenges and experiences of other successful nations in this regard.
- vi. The UAE will pursue any peaceful domestic nuclear power programme in a way that best ensures sustainability. In all, the continuity of the country's nuclear power programme is important. As so much is put in to achieving the goals of nuclear power, the researcher expects that proper maintenance culture is put in place to ensure that the programme is sustained.

⁸⁸ Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy, Op Cit.

The UAE selected the South Korea Electric Power Corporation (KEPCO) to build the first nuclear reactor supervised by the Abu Dhabi Water and Electricity Authority ⁸⁹[see Appendix 3 (Certificate of Competent Authority for Radioactive Package Design) and Appendix 4 (License for the Construction of a Nuclear Facility)]. The selection of KEPCO was based on the company's affordability and training of indigenous personnel compared to the American and European companies. South Korea possesses commendable track records in this regard. The finalisation on the area of building the reactor, the planning of safety regulations and review of environmental effects were carried out two years ago, in the UAE⁹⁰. There are nuclear power generation stations to be set up at Baraka and at three other places, which will be functional from 2020. The UAE has been successful in getting financial help from Korea for building the power plant in Abu Dhabi⁹¹. In fact, it is Abu Dhabi that has taken the lead in the UAE's efforts to achieve more power through nuclear programmes⁹².

The plan of action was decided by the diplomats of Abu Dhabi and the basic structure of the nuclear energy plan was set out in 2008 by the UAE⁹³. It also enlists the principles that will be followed while the UAE harnesses nuclear power. The objective of the nuclear power programme as enunciated from the documents is to build several nuclear power plants to produce electricity for the seven emirates that will be administered by the local bodies within the UAE⁹⁴.

The need for nuclear power generation arose when power generation through other sources were not enough. It was anticipated by the government of the UAE that there will be an increase in demand for power from 16 gigawatts to 40 gigawatts by the year 2020⁹⁵. According to them the need for power increases at 9% per year⁹⁶. The government of the UAE does not envisage that the economic crunch would affect the projected increase in

⁸⁹ Report on The Integrated Nuclear Infrastructure Review (INIR) Mission to Review the Status of the National Nuclear Infrastructure in The United Arab Emirates, op.cit.

⁹⁰ Christopher Blanchard. M. et al, op.cit.

⁹¹ Emily Meredith and Song Yen Ling, "Cash-Rich Abu Dhabi Seeks Nuclear Financing," *Uranium Intelligence Weekly*, October 18, 2010.

⁹² Ibid. Emily Meredith et al (2010).

⁹³ Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy, op.cit.

⁹⁴ Christopher Blanchard. M. et al, op.cit.

⁹⁵ Ibid. Christopher Blanchard. M. et al, op.cit.

⁹⁶ See Christopher Blanchard. M. et al, op.cit.

demand for power in the future. There are new commercial projects which require heavy volumes of power in Abu Dhabi⁹⁷.

Accordingly, “known volumes of natural gas that could be made available to the nation’s electricity sector would be insufficient to meet future demand.”⁹⁸ The UAE has committed to long period contracts to make available around 600 million cubic feet of natural gas a day to Japan while it buys around 2 billion cubic feet of natural gas from Qatar⁹⁹. The Dolphin pipeline system is used by the UAE to transport natural gas. According to the government of the UAE, the abundantly available petroleum resources may not be economically viable for the production of power. They also doubt its effects on the environment¹⁰⁰. The country also considered using coal as a means for energy production but decided it unsuitable due to its harmful effects on the environment as well as the scarcity of coal even though it is much cheaper than the petroleum products¹⁰¹. Although coal is plentiful in Australia, North America and Europe, its emissions are harmful. Production of electricity through wind and solar energy were also considered by the UAE. Christopher B. M. et al (2010) states that these means may not be sufficient to meet the need for power at the rate of 9 percent yearly¹⁰². The UAE concluded that nuclear energy would be the best source to produce energy that would meet demand by 2020¹⁰³.

The nuclear energy programmes of the UAE aim at producing electricity through setting up several nuclear power generation plants at the same time, with the use of modern technology to ensure safety and security in the plants¹⁰⁴. This plan was intended to be developed through external support. The country is planning open a nuclear power plant

⁹⁷ Chris Stanton, “Taweelah to host chemical city,” *The National* (Abu Dhabi), May 4, 2008; and, Chris Stanton and Ivan Gale, “EMAL smelter remains on schedule,” *The National* (Abu Dhabi), January 13, 2009.

⁹⁸ “Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy,” Released April 20, 2008. Available at <https://pcs.enec.gov.ae/Content/Home.aspx>, Last accessed on 3-08-2012.

⁹⁹ Middle East Economic Digest, “UAE purchases gas from Dolphin pipeline at reduced rate,” May 16, 2008. For more information on the pipeline, see http://www.oxy.com/Our_Businesses/oil_and_gas/Pages/og_mena_dolphin.aspx, last accessed on 3-8-2012.

¹⁰⁰ Christopher Blanchard. M. et al, op.cit.

¹⁰¹ Ibid. Christopher Blanchard. M. et al, op.cit.

¹⁰² See Christopher Blanchard. M. et al, op.cit.

¹⁰³ Report on The Integrated Nuclear Infrastructure Review (INIR) Mission to Review the Status of the National Nuclear Infrastructure in The United Arab Emirates, January 2011, op.cit.

¹⁰⁴ Ibid. INIR

by the year 2017 and a further three nuclear power plants thereafter.¹⁰⁵ This is illustrated in Table 1, Diagram 3 and Diagram 4 below (see next page).

Table 1: Planned UAE nuclear power reactors

	Type	MWe gross	Construction starts	Start up
Barakah 1	APR-1400	1400	July 2012	5/2017
Barakah 2	APR-1400	1400	May 2013	2018
Barakah 3	APR-1400	1400		2019
Barakah 4	APR-1400	1400		2020
Total:		5600 MWe		

Source: World Nuclear, 2013¹⁰⁶

Diagram 3: Map of UAE's nuclear power - Barakah site where ENEC is building the UAE's nuclear power (1)



Source: GulfNews.com, 2013¹⁰⁷

¹⁰⁵ See INIR

¹⁰⁶ Source: <http://www.world-nuclear.org/info/Country-Profiles/Countries-T-Z/United-Arab-Emirates/#.UiCok9K1EoA> Last accessed on 30-08-2013.

¹⁰⁷ GulfNews.com, 2013. Nuclear plants: ENEC picks site. (By Ahmed A. Namatalla, Staff Reporter, Published: April 22, 2010). [Online]: Available at: <http://gulfnews.com/news/gulf/uae/government/nuclear-plants-enec-picks-site-1.616290> Accessed on 16/09/2014.

Diagram 4: UAE's nuclear power - Barakah site where UAE is building the UAE's nuclear power (2)



*Source: GulfNews.com, 2013*¹⁰⁸

The UAE started its nuclear programme in 2008 and within two years, the country was given membership to the IAEA¹⁰⁹. The UAE had no problem in satisfying the requirements that the IAEA had set for them.¹¹⁰ The intention of the UAE in starting the nuclear power plant was transparent and the international community could not suspect anything illegal related to the country's developing nuclear power projects. The UAE was given quick approval since the nuclear programme was widely publicised and the

¹⁰⁸ GulfNews.com, 2013. UAE's nuclear plants built on strong premises. By Francis Matthew (Editor at Large). Published: April 6, 2013. [Online]: Available at: <http://gulfnews.com/news/gulf/uae/general/uae-s-nuclear-plans-built-on-strong-premises-1.1163144> Accessed on 16/09/2014.

¹⁰⁹ Vincent Mulvey (2011). 'United Arab Emirates: Change and Challenge - Nuclear power making its way to the UAE, I.E.L.R 29.

¹¹⁰ The IAEA requirements are:

- i. Government policies and national commitment;
- ii. Action plan for introduction of the first new power plants (NPP) and its integration into the national planning framework;
- iii. Organisational structures and competence for energy and electricity system planning;
- iv. Institutional and organisational structures for independent regulation of radiation protection and nuclear safety and for plant ownership, both with highly qualified and appropriately trained staff;
- v. Adequate supporting infrastructures in industry, research and development (R&D), manpower development, technology transfer and quality management/quality assurance (QM/QA);
- vi. In order to obtain nuclear technology, and supply of nuclear equipment, materials and services, international agreements (implies nuclear safeguards) need to be concluded and
- vii. Financing

See: International Atomic Energy Agency (2001). Nuclear power programme planning: An integrated approach. Vienna: Austria. [Online]. Available at: http://www-pub.iaea.org/MTCD/publications/PDF/TE_1259_prn.pdf Accessed on 10/08/2016.

intention of the authorities to develop nuclear power plants was only to generate electricity for the increased demand¹¹¹.

The country is now in the process of institutionalising and organising the nuclear power growth process. Sadiki (et al) (2011) maintains that several countries in the Middle East have been trying to develop nuclear energy but, as most of these countries are geographically small and are situated near each other; these close geographical constraints pose a threat of chain nuclear accidents¹¹². In case of a nuclear leak, it would make the boundaries of these countries inconsequential, as nuclear radiation would travel beyond such demarcations¹¹³. The peculiar geographical feature of Middle East thus becomes a non-favourable condition for the expansion of nuclear power generators (See Diagram 5) below.

Looking at the observation of Sardiki L.(2011), the researcher does not believe that the geography provides an overwhelming case for the non-development of nuclear energy - at least on a large scale. This is where safety and security come into play. As long as IAEA requirements are met, approval given for the project, building and operational standards are maintained, it is possible that nuclear power development can be feasible. The researcher equally observes that the UK, Sweden and Japan are relatively small geographical areas, yet they have numerous nuclear installations. So, why should geographical argument be used against UAE? Indeed, Japan's environmental instability (earthquake zone) makes the UAE more secure than Japan itself.

¹¹¹ Ibid. Vincent Mulvey (2011).

¹¹² Sadiki Larbi, (2011). 'Going Nuclear: An Arab Oppenheimer?' in Layla Al-Zubaidi, Joachim Paul, Doreen Khoury (eds.), 'Nuclear energy and the Arab World', Perspectives, Heinrich Boll Stiftung 1 April, 2011.

¹¹³ Ibid. Larbi Sadiki (2011).

Diagram 5: Broad map of UAE region – including proximity to other states



Source: Map Data, 2014

The UAE signed the Non-Proliferation Treaty of the IAEA in 1995. It also completed a Small Qualities Protocol in 2003 since the country is a non-nuclear state without a significant nuclear programme or nuclear materials in its possession¹¹⁴. The country has also entered into small cooperation agreements with IAEA mostly in relation to nuclear power generation. The agency had advised the country in 1977 on establishing a nuclear energy administration. In 1984, the small project was launched in the country to consider the aspects of uranium exploration. The government approved a technical cooperation project in 2005 that was designed to access the technical and economic feasibility of nuclear power and desalination plants¹¹⁵. The UAE has also acceded to the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage of 1997 and the Joint Protocol on the Application of the Paris and Vienna Conventions¹¹⁶. The status of the UAE's Non-proliferation and nuclear material safety commitments is given in Table 2 (next page)¹¹⁷.

¹¹⁴ Blanchard, C. M. and Kerr, P. K. (2010), Op Cit.

¹¹⁵ Ibid.

¹¹⁶ Brendel, N. R. and Garn, J. (2012), "Nuclear Liability", K&L Gates, Retrieved From: http://www.klgates.com/files/Publication/30ec13b7-8c42-4506-aa82-9e1c16327eea/Presentation/PublicationAttachment/a12b9be4-bb93-4041-8ea4-aa447c47ba6b/Nuclear_liability_alert.pdf, (Accessed April 04, 2016).

¹¹⁷ Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy, Op Cit.

The researcher maintains that the UAE has shown its readiness to comply with international obligations and to develop its programme of awareness of risks and to provide adequate measures for dealing with potential liability scenarios. This is evidenced by the steady progress so far made.

Table 2: UAE's Non-proliferation and Nuclear Material Safety Commitments

S. No.	Instruments	Year of Commitment
1	IAEA Treaty on Non-proliferation of Nuclear Weapons	1995
2	IAEA Comprehensive Safeguards Agreement	2003
3	IAEA Convention on the Physical Protection of Nuclear Material	2003
4	UN Comprehensive Test Ban Treaty	2000
5	UN Security Council Resolution 1540	2004
6	UN International Convention for the Suppression of Acts of Nuclear Terrorism	2005
7	IAEA Convention on Early Notification of a Nuclear Accident	1987
8	IAEA Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	1987

Source: Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy

2.6.1.1 The UAE Federal Law No. 06 (2009)

On the recommendations of the IAEA, the government established a Nuclear Programme Implementation Organisation that founded the Emirates Nuclear Energy Corporation (ENEC) based in Abu Dhabi with an initial funding of \$100 million¹¹⁸. The Federal Supreme Council adopted in October 2009, a national law authorising a nuclear

¹¹⁸ Abraham, M. (2014), Op Cit.

programme. The Federal Law No. 6 of 2009, Concerning the Peaceful Use of Nuclear Energy, provides that the operator would be wholly responsible for nuclear safety¹¹⁹.

The Law also prohibits uranium enrichment and spent fuel reprocessing, proposes creation of a Federal Authority for Nuclear Registration (FANR) and advocates development of a nuclear material licensing and control system¹²⁰. UAE nuclear laws are binding and there seems to be nothing to suggest that future governments in UAE will not adhere to them. The country's commitment in the successful implementation of its nuclear energy programme is vigorous.

2.6.1.2 The UAE Federal Law No. 04 (2012)

New legislation was enacted in the UAE on November 14, 2012 - Federal Law No. 4, Concerning Civil Liability for Nuclear Damage. This law attempts to align the UAE legislation with the Protocol of 1997 and to implement the obligations of the UAE under international Conventions. This law brings about several principal changes in the UAE civil nuclear liability regime. It introduces the exclusive legal responsibility for nuclear damages on the operator¹²¹. It establishes operator's liability without requiring any proof of the operator's negligence. It allows for exclusive jurisdiction of the courts of the country where the nuclear accident has occurred. It limits the liability and sets the time limit for claiming compensation¹²². The provisions of this law can be broadly classified into three categories as discussed below. These are also contained in the regimes for civil

¹¹⁹Brendel, N. R. and Garn, J. (2012), Op Cit.

¹²⁰ Blanchard, C. M. and Kerr, P. K. (2010), Op Cit.

¹²¹ Nuclear Damages refer to:

1. Loss of life or any personal injury; 2. Loss of or damage to property; 3. Economic loss arising from loss or damage not referred to in paragraphs (1) or (2) above, incurred by a person entitled to claim for compensation in respect of such loss or damage; 4. The costs of measures of reinstatement of impaired environment, unless such impairment is insignificant, if such measures are actually taken or to be taken, and insofar as not included in paragraph (2) above; 5. Loss of income deriving from an economic interest in use or enjoyment of the environment, incurred as a result of a significant impairment of that environment, and insofar as not included in paragraph (2) above; 6. The costs of preventive measures, and further loss or damage caused by such measures; 7. Any other economic loss, other than loss caused by the impairment of the environment, to the extent that the loss or damages referred to in paragraphs 1-5 and 7 above have emerged from or resulted from ionizing radiation emitted from any radiation source within a Nuclear Installation, or emitted from Nuclear Fuel, Radioactive Products or Waste in a Nuclear Installation, or of Nuclear Material coming from, originating in or sent to a Nuclear Installation,, whether arising from the radioactive properties of such material or from a combination of radioactive properties with toxic, explosive or other hazardous properties of such material. See: Federal Law by Decree No. 4 of 2012 Concerning Civil Liability for Nuclear Damage.

¹²²Brendel, N. R. and Garn, J. (2012), Op Cit.

liability analysed earlier in this chapter. However, the UAE is complying with international obligations.

a) Channelling of Liability

The Federal Law 4 provides that the entire civil liability arising from a nuclear accident should be channelled exclusively to the operator of the nuclear facility. In some cases, the transporting party or the party handling the nuclear material may also be held liable. The law held the operator strictly, solely and exclusively liable for ‘nuclear damages’ subject to the condition that it is proved that the damage is caused by a nuclear incident. In cases where it is established that nuclear damage has occurred then the law provides that strict liability be imposed with no requirement to establish operator’s negligence or any type of fault. The term nuclear damage is defined in a similar manner as per the definition given in the 1997 protocol that it includes death or personal injury, loss of or damage to property, economic loss, cost of restoring the damaged environment, or loss of income from an economic interest arising from using the environment¹²³.

b) Limits on Operator’s Liability

The Law sets limits for the liability of the operator along with defining the period within which compensation can be claimed. For each nuclear accident, operator’s liability is fixed and it requires the operator to take insurance or other financial security to adequately cover the liability limit. The law also states that claims for compensation can be made within 3 years of the date the person suffering damage had knowledge or ought to have had the knowledge of the damage. For loss of life or injury, the victim is required to make a claim within 30 years and for other damages the claims can be made up to 10 years. In addition, the law also exonerates the operator, partially or fully, from any type of claim if a court rules that the damage has been caused by the gross negligence of the person suffering the damage¹²⁴. The author observes that there seems to be no provision to cover claims for ‘latent damage,’ that is damage that occurs but remains hidden for a time and is not obvious to anyone, including possible victims (example: development of cancer within individuals following radiation leak). This is equally important as it may take a very long period for victim to start realising the impact of such damage.

¹²³ Ibid.

¹²⁴ Ibid.

c) Operator's Right of Recourse

The law also provides the operator the right of recourse if such an option is expressly written in the contract, or if the person who has suffered nuclear damage, has caused a nuclear incident by an act or omission with the intent to cause damage. It implies that the operator has the right to claim contractual indemnity claims against a supplier or contractor or any other person who has caused the damage¹²⁵. The researcher suggests that reliance on contract terms should not be the only possible scenario that operators can claim indemnity for losses, rather international or domestic laws should also provide for this.

2.6.2 Emerging criticisms

While interest in nuclear power generation has become more widespread, there is also a sharp increase in campaigning for a more environmentally friendly alternative to fossil fuels which include coal and natural gas. Global-warming has become a threat to the ecosystem and for this reason; the need to go 'green' cannot be overemphasised.

Supporters of nuclear power maintain it is an indispensable alternative energy production to fossil fuels; yet opponents uphold that past nuclear incidents are warning enough as to the negativities of such power production and are evidence that the costs have become excessive, too high to substantiate the safety hazards and risks involved.¹²⁶

The researcher argues that if the threats of global warming are to be addressed alongside the satisfaction of the rising desire for electricity, then determined development of nuclear power is necessary. It is noted that the production of electricity accounts for nearly a third of U.S. greenhouse emissions, mainly from burning fossil fuels to generate power and consequently, greenhouse gases like carbon dioxide, are accumulated in the atmosphere

¹²⁵ Ibid

¹²⁶Totty, M. (2008). The Case for and Against Nuclear Power. *The Wall Street Journal*. (Updated June 30, 2008). [Online]. Available at: <http://www.wsj.com/articles/SB121432182593500119> Accessed on 10-10-2015.

contributing to a steady increase in global standard temperatures.¹²⁷ The researcher reasons that this likely is why UAE is avoiding fossil fuel systems.

Totty, M. (2008) says that plants generating nuclear power do not release carbon dioxide, sulphur or mercury and its full life cycle emission is comparable to that of wind and hydropower and less than solar power.¹²⁸ Even when taking into consideration ‘full life-cycle emissions’ which consist of mining of uranium, shipping fuel, building plants and managing waste, carbon-dioxide releases from nuclear plants are inconspicuous. The author views that power generation from a nuclear source is not the only answer to green ecosystems. There is still the need to explore other green sources, such as wind and solar.

An important criticism against the nuclear energy generation of the UAE according to Supersberger (2011) is that the ill effects of nuclear power generation is shifted on to other countries via the export of used nuclear fuel rods to other countries. However, this does not decrease the level of risks posed by nuclear waste¹²⁹. This is because nuclear wastes still have the potential to cause damage despite having already been exploited

There are also problems posed by using conventional methods that affect the change in climatic conditions, such as the dangers of producing environmentally hazardous waste materials. Thus, the use of nuclear energy to produce power gains more strength. The production of electricity through conventional methods utilises non-renewable resources. These resources are perishable and will be unavailable to the coming generations if used without any restrictions. The researcher poses that in nuclear power production, the waste products bring about a threat to the coming generations through radioactive materials if they are not properly disposed of.

An international concurrence has been reached subscribing to deep geological disposal on land as being the most suitable means for disposing high level radioactive waste

¹²⁷ See Totty, M. (2008).

¹²⁸ Ibid Totty, M. (2008).

¹²⁹ Nikolaus Supersberger (2011). ‘The Arab Region as part of a Nuclear Renaissance: Outlooks and Alternatives’ in Energy’ Layla Al-Zubaidi, Joachim Paul, Doreen Khoury (eds.), ‘Nuclear energy and the Arab World’, Perspectives, Heinrich Boll Stiftung 1 April, 2011.

(HLW)¹³⁰ permanently from man's environment¹³¹. Nevertheless, other options include disposal in geological formations under the deep ocean floor; on the ocean floor; in glaciated areas; extra-terrestrial disposal; and destruction by nuclear transmutation¹³². Additionally, extended storage, whether at sites of production or in a centralised store, may, as a standard, be an adequate waste management approach, provided it is not supposed to be continued for longer than is reasonable and safe and is to be replaced by a more stable solution afterwards¹³³. The UAE intend to store radioactive waste in the country for 20 years, after which it will be removed using new techniques while most radioactive wastes will be sent back to South Korea for treatment and reprocessing, then would be re-imported again, into the country. With these, the author opines that the UAE system in nuclear power generation will emerge viable.

Critics tend to dispute that the cost of construction of a nuclear power plant is very high, thus making nuclear power uneconomical when compared to other power sources. This argument may be justified, as the processes toward acquiring a new plant can be extremely cumbersome and time consuming, possibly affected by political and regulatory delays. Naturally, these circumstances incur huge costs, but the justification is that, in the end, the gains will far outweigh the expenses. The delays in developing a new plant can also leave lenders with uncertainties over quick recovery of their investment funds. The researcher's view is that the long-term benefits of a nuclear plant offset any criticism over construction costs, as the money is reclaimed through usage.

There have also been repeated arguments concerning the safety of nuclear plants, especially during accidents. Likely these criticisms emanate from the stance of past nuclear incidents which include those of the Three Mile Island plant in Pennsylvania in 1979 and the 1986 explosion at the Chernobyl plant in the Ukraine. About thirty-three serious incidents and accidents at nuclear power stations have been identified since the first, recorded at Chalk River in Ontario, Canada (1952). Of those most publicly

¹³⁰ High-level radioactive waste (HLW) means highly radioactive wastes requiring permanent isolation from man's environment that arise as a by-product of nuclear power generation. [See: Nuclear Energy Agency (NEA), (1989)].

¹³¹ Nuclear Energy Agency (NEA), (1989). Issue Brief: An analysis of principal nuclear issues. The disposal of high-level radioactive waste. No. 3, January 1989. [Online]. Available at: <https://www.oecd-nea.org/brief/brief-03.html> Accessed on 12/08/2016.

¹³² See: Nuclear Energy Agency (NEA), (1989).

¹³³ See: Nuclear Energy Agency (NEA), (1989).

recognised, six occurred in the US, five in Japan, three in the UK and three in Russia (See Table 3 below)¹³⁴.

Table 3: Nuclear power station accidents and incidents from 1952-2011

Nuclear power station accidents and incidents from 1952 - 2011				
Year	Incident	INES level	Country	IAEA description
2011	Fukushima	5	Japan	Reactor shutdown after the 2011 Sendai earthquake and tsunami; failure of emergency cooling caused an explosion
2011	Onagawa		Japan	Reactor shutdown after the 2011 Sendai earthquake and tsunami caused a fire
2006	Fleurus	4	Belgium	Severe health effects for a worker at a commercial irradiation facility because of high doses of radiation
2006	Forsmark	2	Sweden	Degraded safety functions for common cause failure in the emergency power supply system at nuclear power plant
2006	Erwin		US	Thirty-five litres of a highly-enriched uranium solution leaked during transfer
2005	Sellafield	3	UK	Release of large quantity of radioactive material, contained within the installation
2005	Atucha	2	Argentina	Overexposure of a worker at a power reactor exceeding the annual limit
2005	Braidwood		US	Nuclear material leak
2003	Paks	3	Hungary	Partially spent fuel rods undergoing cleaning in a tank of heavy water ruptured and spilled fuel pellets
1999	Tokaimura	4	Japan	Fatal overexposures of workers following a criticality event at a nuclear facility
1999	Yanangio	3	Peru	Incident with radiography source resulting in severe radiation burns
1999	Ikitelli	3	Turkey	Loss of a highly radioactive Co-60 source
1999	Ishikawa	2	Japan	Control rod malfunction

¹³⁴Guardian News and Media Limited, Datablog (2016). Nuclear power plant accidents: listed and ranked since 1952. [Online]. Available at: <https://www.theguardian.com/news/datablog/2011/mar/14/nuclear-power-plant-accidents-list-rank> Accessed on 13/08/2016. According to Guardian News, the information is partially from the IAEA which, astonishingly, fails to keep a complete historical database and partially from reports.

Nuclear power station accidents and incidents from 1952 - 2011

Year	Incident	INES level	Country	IAEA description
1993	Tomsk	4	Russia	Pressure build-up led to an explosive mechanical failure
1993	Cadarache	2	France	Spread of contamination to an area not expected by design
1989	Vandellos	3	Spain	Near accident caused by fire resulting in loss of safety systems at the nuclear power station
1989	Greifswald		Germany	Excessive heating which damaged ten fuel rods
1986	Chernobyl	7	Ukraine (USSR)	Widespread health and environmental effects. External release of a significant fraction of reactor core inventory
1986	Hamm-Uentrop		Germany	Spherical fuel pebble became lodged in the pipe used to deliver fuel elements to the reactor
1981	Tsuraga	2	Japan	More than 100 workers were exposed to doses of up to 155 millirem per day radiation
1980	Saint Laurent des Eaux	4	France	Melting of one channel of fuel in the reactor with no release outside the site
1979	Three Mile Island	5	US	Severe damage to the reactor core
1977	Jaslovské Bohunice	4	Czechoslovakia	Damaged fuel integrity, extensive corrosion damage of fuel cladding and release of radioactivity
1969	Lucens		Switzerland	Total loss of coolant led to a power excursion and explosion of experimental reactor
1967	Chapelcross		UK	Graphite debris partially blocked a fuel channel causing a fuel element to melt and catch fire
1966	Monroe		US	Sodium cooling system malfunction
1964	Charlestown		US	Error by a worker at a United Nuclear Corporation fuel facility led to an accidental criticality
1959	Santa Susana Field Laboratory		US	Partial core meltdown
1958	Chalk River		Canada	Due to inadequate cooling a damaged uranium fuel rod caught fire and was torn in two

Nuclear power station accidents and incidents from 1952 - 2011				
Year	Incident	INES level	Country	IAEA description
1958	Vinča		Yugoslavia	During a subcritical counting experiment a power build-up went undetected - six scientists received high doses
1957	Kyshtym	6	Russia	Significant release of radioactive material to the environment from explosion of a high activity waste tank.
1957	Windscale Pile	5	UK	Release of radioactive material to the environment following a fire in a reactor core
1952	Chalk River	5	Canada	A reactor shutoff rod failure, combined with several operator errors, led to a major power excursion of more than double the reactor's rated output at AECL's NRX reactor

Source: Guardian News and Media Limited, Datablog, (2016)

The effects of these accidents generated much concern. Fortunately, today, nuclear plants are much safer than they were in the past primarily because they possess safety features¹³⁵. Unlike previously, in the case of accidents today, nuclear plants would contain rather than emit radioactive materials. It is noted that there are more safety features at nuclear plants, plant personnel are better trained, and reactors have been redesigned so that accidents are unlikely to occur.

Critics also argue that nuclear power expansion will increase the risk or possibility that potentially antagonistic countries will decide to use nuclear material from a power programme to develop weapons of mass destruction. The researcher points out that this is where non-proliferation is considered; for the fact that adequate mechanisms and treaties have been put in place to check proliferation, it is possible that potential nations can be subdued. UAE is seeking peaceful use of its nuclear programme and is not looking at exploiting it for weapons of massive destruction. The UAE is principally interested in boosting its electricity generation and is doing everything possible to achieve the set goal.

¹³⁵ See Totty, M. (2008).

2.7 Evaluation of the UAE's Nuclear Programme

This section shows how the UAE have considered and dealt with the criticisms discussed above. The UAE's entire nuclear programme depends almost on foreign entities for material, technology and expertise¹³⁶. The nuclear laws in the UAE are completely in line with international nuclear principles and norms. The UAE has set the liability limit at roughly 450 million special drawing rights for its nuclear agreement with KEPCO, which is higher than the limit prescribed under the Vienna Convention. The main point to be noted here is that in case of the UAE, the operator is a foreign entity. This situation raises some challenges for the future growth and development of nuclear energy programs in the country¹³⁷.

The nuclear regulator in the UAE is the Federal Authority for Nuclear Regulation (FANR). The governing board of this body comprises of only UAE nationals, whereas, senior management, scientists and other top level executives are all foreign nationals. Moreover, the UAE retains foreigners as operator and suppliers of nuclear material. Hence, in the case of a potential nuclear accident, absence of a dedicated in-house team of experts to determine compensation claims and extent of liability would be a big limitation for the country.

In addition, the jurisdiction of the UAE's court over foreign entities is another important factor which must be considered when entering new agreements¹³⁸. The researcher therefore considers that as a major characteristic of modern nuclear law, exclusive control over court of law empowers the UAE Court of Competent Jurisdiction to try cases of nuclear damage and that the outcome of such case(s) remains respected regardless of the parties involved. The UAE has aligned its court jurisdiction with international obligations.

The Federal Law 4 of 2012 has clarified many provisions regarding the potential liability for nuclear damage and has brought about a synergy between the 1997 Protocol and UAE's legislation. It should be noted that since this law is published in Arabic, any

¹³⁶ Abraham, M. (2014), Op Cit.

¹³⁷ Ibid.

¹³⁸ Ibid.

potential conflict with its English version will be resolved in favour of the original Arabic. The contracting parties should consider both the provisions of this law in the context of Islamic Shariah and the applications of this law under UAE's Federal and local Emirate laws¹³⁹. It is possible that this could raise broader concerns, relating to the adequacy of the UAE legal system to administer cases of possible liability. It should be understood that the essence of this is to avoid the negation of the country's original traditional values. Shariah is not likely to make parochial provisions against the domestic and international obligations. Shariah is compatible with the UAE's undertakings and will help deepen the people's understanding of the country's nuclear energy programme.

2.7.1 UAE's Nuclear Power Programme and manpower development

The nuclear reactors are intended to provide more employment opportunities to the inhabitants thereby increasing the dependency of the business sector of the country to the local labourers¹⁴⁰. The majority of the population in the UAE are from other countries¹⁴¹. Citizens of the Emirates add up to only less than a quarter of the total population. Most of the people living in the country are from Asia and are skilled workers¹⁴². Since the country is known to be a wealthy sovereign state through petroleum reserves, paying and providing for most foreign population is not a matter of concern for the country. Such practise has helped the UAE, as well as the labour force from outside the country¹⁴³. The researcher observes that in the situation whereby petroleum reserves are running out, it is possible that this will impact upon the population and work-force; hence other potential economic sources would be liable for exploitation.

The long-standing practice of appointing foreign workers in some industries has, in effect, made a monopoly of the foreign labourers¹⁴⁴. This has in turn affected the indigenous population's skills development with regards to acquiring necessary expertise in the field. Thus, this affects the Emirates' participation in the development of nuclear power plants¹⁴⁵. Since the industrial sector has not flourished historically alongside other

¹³⁹Brendel, N. R. and Garn, J. (2012), Op Cit.

¹⁴⁰ See Vincent Mulvey (2011).

¹⁴¹ Ibid. Vincent Mulvey (2011).

¹⁴² See Vincent Mulvey (2011).

¹⁴³ Ibid. Vincent Mulvey (2011).

¹⁴⁴ Ibid. Vincent Mulvey (2011).

¹⁴⁵ See Vincent Mulvey (2011).

industrialised countries, the inhabitants of the UAE have no long-term transfer of the required skills. Thus, employment of citizens of the Federation becomes tough, with very few individuals skilled enough to be accommodated in the nuclear power industry¹⁴⁶.

According to Supersberger (2011), the country lacks the required expertise and technology for power production through nuclear power reactors¹⁴⁷. This would mean that the country should depend on other countries, not only for nuclear fuel, but also for technological advancement¹⁴⁸. The researcher therefore suggests that methods detailing how to deal with a lack of expertise and technical abilities in the native population require inclusion within the UAE's plans for its successful implementation of a nuclear system.

The government was aware of the lack of availability of indigenous skilled persons from the Federation to work for the new nuclear programme. The government was cognisant of this difficulty even while awarding the contract to Korea Electric Power Company to build the nuclear power plants [see Appendix 3 Certificate of Competent Authority for Radioactive Package Design and Appendix 4 License for the Construction of a Nuclear Facility]. The scarcity of skilled indigenous labour affects the development of the nuclear power plants by the local labour force¹⁴⁹. Even though some argue that the nuclear power generation would increase the prospects of employment in the country, there is only a limited scope for the generation of employment, when compared to other sources of power generation¹⁵⁰.

According to Supersberger (2011), the creation of electricity through renewable sources provides opportunities to both low skilled and high skilled employees¹⁵¹. Acknowledging this debate, one might ask why the UAE is not investing in renewable sources. The author poses that whilst renewable sources may provide better work opportunities for the workforce, the viability of renewable sources does not actually meet the State's demands for energy. Thus, the workforce should be trained and educated into the nuclear system.

¹⁴⁶ Ibid. Vincent Mulvey (2011).

¹⁴⁷ Nikolaus Supersberger (2011). 'The Arab Region as part of a Nuclear Renaissance: Outlooks and Alternatives' in Energy' Layla Al-Zubaidi, Joachim Paul, Doreen Khoury (eds.), 'Nuclear energy and the Arab World', Perspectives, Heinrich Boll Stiftung 1 April, 2011.

¹⁴⁸ Ibid. Nikolaus Supersberger (2011).

¹⁴⁹ Emirates Nuclear Energy Corporation press release, December 27, 2009 and see Vincent Mulvey, op.cit.

¹⁵⁰ Nikolaus Supersberger, op.cit.

¹⁵¹ Ibid. Nikolaus Supersberger (2011).

It should be envisaged that this will involve costs, time and availability of experts from abroad to act as teachers. Perhaps, the reason for UAE's non-involvement in renewable energy is that it is sometimes criticised for being variable or intermittent¹⁵².

ENEC aims at developing the local skills and talents of UAE citizens to be utilised in developing the power generation programme of the UAE¹⁵³. According to the publication of the ENEC the contract for the development of nuclear power plants "call[s] for extensive training, human resource development, and education programmes as the UAE builds the capacity to eventually staff the clear majority of the nuclear energy programme with national talent."¹⁵⁴ Consequently, there is a training programme in place to achieve this, described below.

According to the Chief Executive Officer (CEO) of ENEC in Mulvey (2011), "The KEPCO team dedicated a highly-experienced team to our project and has shown a serious commitment to transferring the knowledge gained from Korea's 30 years of successful nuclear industry operation into the UAE programme."¹⁵⁵ Mulvey (2011) states that an institution for the development of human resources and skills for UAE nationals was considered an urgent need by the government. Thus, Gulf Nuclear Energy Infrastructure Institute (GNEII), with the co-operation of Sandia National Laboratories and the Nuclear Security Science and Policy Institute of the United States of America (USA) and the University of Khalifa are to help in this regard¹⁵⁶. The Institute was to be formed with the support of the ENEC and the Federal Authority for Nuclear Regulation (FANR) of the UAE¹⁵⁷. Mulvey (2011) also states that the objective of the formation of the GNEII is: "To prepare the institute's staff and GNEII program graduates to help GNEII become, within five years after its inauguration, a self-sustaining source of nuclear safety, security, and non-proliferation education consistent with international standards."¹⁵⁸

¹⁵² Renewable Energy Debate. [Online] Available at: http://www/Renewable_energy Last accessed on 06-03-2014.

¹⁵³ Emirates Nuclear Energy Corporation Press Release, December 27, 2009, op.cit.

¹⁵⁴ Ibid. Emirates Nuclear Energy Corporation Press Release, December 27, 2009, op.cit

¹⁵⁵ Vincent Mulvey, op.cit.

¹⁵⁶ Ibid. Vincent Mulvey (2011).

¹⁵⁷ See Vincent Mulvey (2011).

¹⁵⁸ Ibid. Vincent Mulvey (2011).

The attempt of the UAE government to offer guidance on the building of nuclear power plants is a welcome move for the development of nuclear power generation. To construct and operate nuclear power plants, it is important that the labour force is well equipped with the much-required knowledge, on all segments of nuclear power plants, from the very lowest to the highest level. It is not until knowledge is inculcated at all levels, that the nuclear programme may be successful¹⁵⁹.

It cannot be forgotten that the learning of a skill based talent needs theoretical, as well as practical knowledge. Mulvey (2011) added that imparting knowledge on all levels of nuclear power generation requires the practical experience at the site of power generation and cannot be concluded by classroom teaching¹⁶⁰. Even if it is an engineer with a decade's experience in the nuclear industry, or a tradesman who works with the coolant pump, they all require practical experience to know the difference in the sounds made by the machinery, to come to a conclusion should the plant require a repair¹⁶¹. The asset of practical experience cannot be replaced by mere theoretical knowledge. Such hands-on experience would help in diverting an accident or a fault in the industry well before it causes irreparable damage¹⁶². Such a transfer of practical knowledge is the most important aspect when deliberating the training of persons working in nuclear power plants, since a slight change in the work routine could lead to unimaginable catastrophe(s). While there is skills shortage within UAE, this practical experience is to be achieved through its government sending workers to South Korea to learn the practical skills necessary for the running of the energy programme.

The country is deficient in skilled manpower. This was thought to be remedied, by entering a contract with the Korean group of companies to transfer the skill sets from Korea to the UAE. It was expected to be time consuming since there are considerable differences between the societal systems and individuals' mind-sets. Even if the country's authorities are successful in up-skilling the citizens with the necessary skills and knowledge for running nuclear power plants, there could be numerous other challenges that need to be faced by the authorities promoting the development of the nuclear power

¹⁵⁹ Christian Blanchard, op.cit and also see Vincent Mulvey, op.cit

¹⁶⁰ Vincent Mulvey, op.cit.

¹⁶¹ Ibid. Vincent Mulvey, op.cit.

¹⁶² See Vincent Mulvey, op.cit.

projects¹⁶³¹⁶⁴. Mulvey (2011) maintains that it is doubtful whether the time-consuming training process would help UAE nationals gain higher positions in the nuclear power programme¹⁶⁵. Instead the more menial job positions may initially be filled by nationals whilst the higher positions are given to foreign nationals. This would not satisfy the need for an Emirate to run the nuclear programme, as is preferred by the government. Nevertheless, to date, the contractual relationships have progressed well enough to enable the fulfilment of the contract¹⁶⁶.

2.7.2 UAE'S Nuclear Energy Programme and the international community

The increased awareness of nuclear power production has made the international community doubt the intention of many states in harnessing nuclear energy which might possibly lead to nuclear explosion¹⁶⁷. There are concerns expressed by other states as to the suitability of a nuclear resource located within the Middle East. The researcher therefore queries: So, if nuclear facilities exist in Israel, why not in other Mid-Eastern states? This illustrates that the security issues would be similar, surely.

The study's significance increases with the escalation of fear amongst the international community regarding the use of nuclear weapons at the outbreak of a war. The consequences of using nuclear weapons have been seen in various parts of the world, for example Japan and South Sea Islands. The international community's concern increases with the notion that the Gulf countries encourage terrorist activities and that this could lead to the use of nuclear weapons by terrorist groups. The UAE's decision to use nuclear energy for peaceful purposes therefore attracts attention from the global community. Although these concerns are justified, for global peace and security, the UAE's decision is a welcome one. Any research on this topic understandably attains significance in the

¹⁶³ Ibid. Vincent Mulvey, op.cit.

¹⁶⁴ Claire Boudreau, Daniel Cogné. *Actes Du 22e Congrès International Des Sciences Généalogique Et Héraldique À Ottawa*, 18-23 Août 1996.

¹⁶⁵ See Vincent Mulvey, op.cit.

¹⁶⁶ Christian Blanchard, op.cit and see Vincent Mulvey, op.cit

¹⁶⁷ Report on The Integrated Nuclear Infrastructure Review (INIR) Mission to Review the Status of the National Nuclear Infrastructure in The United Arab Emirates, January 2011, Available at <http://www.iaea.org/NuclearPower/Downloads/Infrastructure/files/UAE-INIR-Mission-January-2011-Report.pdf>, Last Accessed on 4-08-2012.

present international circumstances. In terms of protecting nuclear plants from terrorist activity, the government plans to use its security forces to guard the facilities.

These issues were deliberated upon in depth by the UAE, which consequently formulated policies to combat these threats to the international community. In order to reassure the international community that the UAE does not intend to amass nuclear power, the UAE resorted to fuel supply outside its boundaries¹⁶⁸. This has assured other countries of the real objectives of the nuclear power programme in the UAE.

2.8 Philosophical and ethical arguments for the use of resources for peaceful purposes

There have been some moral arguments raised both for and against the use of nuclear energy for peaceful purposes. These arguments tend to be geared towards guiding against the effects of nuclear power production on the present and future generations. Since this involves decisions regarding the duties to be performed by the present generation, the next aspect of the moral obligation would be on whose shoulders the duty will fall, so as to provide for the welfare of the future generation. It is opined by many that the financially less fortunate are the ones who will bear the burden, thus the issue of providing for the future generations has ultimately led to a situation that relates within one generation as to who should bear the burden of the moral duties towards the future generations¹⁶⁹. The UAE has taken this into consideration as could be seen in its policy statements.

The continuing use of the current nuclear fuels in the future is not certain. There could be a technological boom that encourages different methods of electricity production other than the ones employed now. Therefore, it cannot be certain that future generations would use the same technology to produce the power and moreover whether the same fuel will be used to generate power. The researcher suggests that the present generation preserve the facilities that are available now for the future generations also. The moral obligations are such that it encourages the present generation to perform according to the needs of the future generations.

¹⁶⁸ Christopher Blanchard M. et al, op.cit.

¹⁶⁹ Shrader-Frechette, K. S. (1997). Risk and rationality. University of California Press Berkeley.

The alteration in the resource cycle itself can bring about astonishing changes in the future availability of the resource. The whole cycle of a uranium nuclear power plant happens in different stages. The first step of extracting uranium and its enrichment is followed by its filling in the reactor, for chemical reactions to occur, which results in the formation of nuclear wastes. These wastes are then treated before disposal. The one-through fuel cycle employs uranium once and the fuel that is not irradiated becomes waste. Such wastes are disposed of for 200,000 years. Despite the risk involved, the storage of nuclear wastes is a viable process. On the other hand, in a closed fuel cycle the waste after the first irradiation is treated and reused as fuel for the next process of irradiation. It is known as reprocessing of nuclear wastes and the UAE is also contemplating this.

Re-usage enables the prolongation of nuclear fuel use. This process is utilised in many parts of Europe. Moral duties may be realised in optimal utilisation of nuclear fuel. Another option for reusing the nuclear fuel is to partition and transmute, which enables the separation of components which are capable of being irradiated and then reusing them in the reactor. The efficiency of the Uranium nuclear fuel can be increased by using breeder fuel cycle and employing certain plutonium isotopes.

The negative and positive moral aspects of nuclear energy production determined by the present generation affects those in the future. However, the moral aspect of the nuclear energy production can be ascertained using modern techniques, like Partitioning and Transmutation and this is a good thing to do. Thus, the moral issues of nuclear power production can be dealt with by the combined usage of modern techniques and risk analysis. The researcher believes that this method would ensure the safety, security and prolongation of the nuclear fuel. The alternative to using this technology is that the plutonium extracted during this method can be used for the development of weapons of mass destruction. This is the reason why reprocessing of nuclear waste is not encouraged, for fear of proliferation by countries. The UAE, through strict monitoring of its nuclear programme, will successfully deal with this.

Another major crisis that will be brought about by the present generation utilising nuclear power plants is the threat of nuclear waste. Merely the inability to anticipate the methods or techniques that will be employed in the future makes the disposal of nuclear wastes of great concern. According to Ekeli (2004), the inability to foresee the needs of the coming

generations diminishes the responsibility of the present generation towards them¹⁷⁰. The researcher argues that if Ekeli (2004) is saying that because we do not know what future generations will want we are not responsible for considering them, then this is not morally acceptable. Sustainable development suggests that we are morally responsible, as well as accountable, towards future generations. The task then is to assess the risks now and diminish any potential harm in the future. We can assess the risk, so we ought to do something about it, which is contrary to what Ekeli is suggesting here.

Golding (1981) maintains that the responsibility towards the future generation(s) is inversely proportional to the remoteness of the future generation from the present generation.¹⁷¹ This means responsibility reduces with the increase in the distance between the future and present generations¹⁷². This also is not morally acceptable, as one should be able to do what is moral, irrespective of time. So, he is saying that as we do not know what future generations want, we do not need to consider them. Yet, the whole point of developing nuclear energy within the UAE is to deal with the future implications of exhaustive supplies of petroleum and the need to produce energy for future generations. Therefore, the points raised by Ekeli and Golding can be rebutted. The Bruntland Commission suggested that sustainable development is any development that “meets the needs of the present without compromising the ability of future generations to meet their own needs”¹⁷³. This sets a moral objective based on social needs (not wants or desires) and shows how the needs of today need to be assessed considering the needs of tomorrow.

The waste disposals that are carried out now are aimed at protecting the generations for the next 10,000 years, meaning that the population existing after this period will be exposed to more radiation.¹⁷⁴ The present generation cannot be expected to live in anticipation of the protection of generations that might exist in 10,000 years. This diminishes the obligations of the present generation towards those of the future. These impediments of the present generation to provide safety for future generations might

¹⁷⁰Ekeli, Skagen K. (2004) ‘Environmental Risks, Uncertainty and Intergenerational Ethics’, in: *Environmental Values* 13 (4): pp421- 448.

¹⁷¹Golding, M. P., (1981). ‘Obligation to Future Generations’, in: Partridge, E. (ed.) *Responsibilities to Future Generations: Environmental Ethics*, (Prometheus Books, Buffalo, New York) 61-72.

¹⁷² Ibid Golding (1981).

¹⁷³ World Commission on Environment and Development (1987). *Our Common Future*, Oxford University Press.

¹⁷⁴ Ibid Golding (1981).

confuse those in the present as to whether they really owe a duty towards the generations to follow. Nonetheless, it could be deduced that the current generation has a responsibility towards the next generation or at least the generations that will exist within a short period from now. Such an obligation cannot be disregarded by the present population. This is presented in the Rio and Kyoto treaties on environmental harm and sustainable development.

The question of bearing the burden by the present generation for the welfare of the future generation requires an answer: according to OECD (1995), the persons responsible for the production of nuclear waste are the present generation and thus, must take the responsibility of treating it, without impacting greatly upon their successors¹⁷⁵. Since the present generation uses nuclear reactive materials to benefit themselves, it is necessary for the beneficiaries to ensure that there are no ill effects for the next generations. There is no doubt that the beneficiaries should bear the burden of protecting the future generations also. But on whom should these responsibilities be attached in the present generation?

According to Bullard et al (2000), the responsibility of having greater safety measures and security is usually borne by those categorised as belonging to the lower middle class in terms of income, within the same generation¹⁷⁶. Greater risk of nuclear reactions will be faced by economically backward people within this generation. For the improved safety of the future generation(s), the present will have to suffer. This may not be a welcome move, therefore threatens the safety and security of the coming generations. The priority concern is the way in which moral issues are resolved. For this reason, in order to avoid disparity between sections within one generation, a solution should arise within that generation, rather than forgetting the moral obligations of any generation towards the next.

¹⁷⁵ IAEA-NEA, 'Uranium 2001: Resources, Production and Demand', in *A joint report by the OECD Nuclear Energy Agency and the International Atomic and Energy Agency*, (Paris: IAEA and NEA-OECD, 1995)

¹⁷⁶ Bullard, R. D. (1994). *Unequal protection: Environmental justice and communities of color*, Sierra Club Book, San Francisco, CA, and Bullard, R.D., and Johnson, G.S. 'Environmental justice: grassroots activism and its impact on public policy decision making', 2000 *Journal of Social Issues* 56 (3), pp. 555-578.

There are also various legal issues distinctive to nuclear power programmes for electricity production. The insurance contract does not include provision for indemnity and subrogation. Since the operator of the power programme is exclusively liable for the damage that might occur in the case of a nuclear accident or fallout, the doctrine of indemnity in the insurance contract of a nuclear power plant would vitiate the legal principle. The construction of the plant itself is different from other kinds of conventional methods of power production. The constructor cannot be given control of the nuclear power plant until it is proved that the plant works according to the contractual requirements. Hence, the rejection of a constructed nuclear power plant is not within the rights of the operator of such plant.

Even if there are any defects in the construction or design of the power plant, the operator cannot reject the plant since the working of the nuclear power plant can exclusively be done by the constructor. The contractors for the construction of the plant cannot be held liable even if the accident occurs due to a fault in the design or construction. It should be acknowledged that the construction of a nuclear power plant cannot be done by one contractor since it has two distinct parts that can be performed only by experts in the field.

Therefore, the best moral framework that suits the production of electricity through nuclear fuel would be to adopt a nuclear reactor that can reuse nuclear fuel through partitioning. This method would reduce the amount of nuclear reactive wastes as well as possible risks. While this might not be sufficient, it can greatly mitigate the burden on future generations. It is expected by the present generation to suffer a little in return for the massive benefit they receive using nuclear power plants and to reduce the impact of such usage on the coming generations. Thus, a viable solution to perform moral duties is to go for a reusable method of power production to reduce the impact of such power production.

The nuclear power reactors can pose a huge danger to the environment and living things if not dealt with properly. Leakage or other nuclear accidents might occur which can be extremely harmful. In order to avoid these, nuclear power plant operators are expected to take all the necessary safety and security measures. Reusability of nuclear reactive materials necessitates a safer practice. It is not sufficient to meet the waste management

requirements; the obligations to the future generation must also be satisfied. There are other issues such as the impact of nuclear accident and mitigation of such occurrence.

Moral values might expect that the present generation perform sustainably, but moral values or obligations are not mandatory and therefore are not enforceable. The international community should draft laws or regulations through IAEA Conventions aimed at protecting the interests of future generations, whilst also ensuring that the right to have efficient use of energy is availed of by the present generation. This should also be applicable to domestic laws. The researcher therefore maintains that the present generation should make use of nuclear energy to produce power, whilst maintaining the long-term vision of providing for the safety of the coming generations.

2.9 A Duty to Act

This section basically gives an insight into a more theoretical analysis of the concept of 'duty'. This helps to provide a theoretical and philosophical support to the exploitation of nuclear energy. Ross (2000) gives more importance to the duty which requires the population refrains from performing an act¹⁷⁷. This means the duty not to do an act, so as to prevent an injury should be given more importance than the duty to do well. These could be moral or legal duties, which may place obligations on others. But can current generations place duties on those to follow? Of course, if a current generation does what is worthy, it is expected that future generations will follow suit.

Rawls (1999) is of the same view that the duties which are framed in the negative format must be given priority over the positive duties¹⁷⁸. Negative duties such as prohibitions are easier to write and define (criminal law is a good example). More positive duties are problematical as the nature and scope of the duty can be flexible and thus often dependent upon current circumstances. However, Golding (1981) differs from all the other academics, philosophers, theorists, or scholars in believing that a positive duty should be

¹⁷⁷ Ross, W. D., (2002). *The Right and the Good*. Edited by Stratton-Lake, P., (Clarendon Press, Oxford).

¹⁷⁸ Rawls, J. (1971). *A theory of justice*, revised edition. The Belknap, Press of Harvard University Press, Cambridge, Massachusetts.

given more importance to the negative duty considering the closest generations that come in future¹⁷⁹.

According to Callahan (1972), in order to provide for the distant generations, it is better to give priority to the negative duty rather than the positive one¹⁸⁰. On the other hand, De-Shalit (1995) proposes the inclusion of both duties by emphasising the need for the positive duty necessary for the future generations, while propounding the need to discourage the negative ones¹⁸¹. A positive duty for the future can be 'weak' - i.e. a duty to protect future generations is limited by the meaning of the words 'protect' and 'future'. Therefore, how would one phrase in law today which places a duty on those in the future, 'protect' when we cannot see what circumstances may exist in the future?

There are various ethical solutions to the problems faced by the adoption of nuclear energy to produce electricity. These solutions require that the present generation perform additional ethical, as well as legal duties so as to protect the coming generations.

There are two reasons why the moral solution casts an extra burden on the present generation. The first one being that the use of nuclear energy is beneficial to the present population, but the ill effects of such usage is passed on to the coming generations. The second follows that the present generation benefiting from the use of nuclear power makes the future generation pay for it. According to Gardiner (2006), the existing generation is lucky enough to enjoy the nuclear fuel that is abundant now, but the generation of power for the benefit of the present population would produce damaging nuclear wastes for the generations to follow¹⁸².

The problems that should be anticipated in the event of electricity production by nuclear power plants are that the nuclear fuel will not last long enough to cater for the needs of the future generation and that the use of nuclear power for electricity will produce wastes

¹⁷⁹ Golding, M. P., (1999). 'Obligation to Future Generations', in: Partridge, E. (ed.) *Responsibilities to Future Generations: Environmental Ethics*, Prometheus Books, (Buffalo, New York, 1981) p. 61-72.

¹⁸⁰ Callahan, D. (1972). 'What Obligations Do We Have to Future Generations?' *American Ecclesiastical Review* 164, pp. 265-80.

¹⁸¹ De-Shalit, A. (1995). *Why Posterity Matters: Environmental Policies and Future Generations* Routledge, London and New York.

¹⁸² Gardiner S. M., (2006). 'A Perfect Moral Storm: Climate Change, Intergenerational Ethics and the Problem of Moral Corruption', *Environmental Values* 15 (3), pp. 397-413.

proven to be harmful to the new generations. To overcome these issues, there are two obligations which the present generation needs to fulfil. The present generation should consider it their duty not to injure the coming generations and to protect their welfare by making the fuel available to them¹⁸³.

It is the usage of nuclear fuel, especially Uranium, which depletes with constant usage that generates nuclear wastes and poses a threat to the future generations. It is not possible to disagree with the argument that we have a duty towards the upcoming generation, since such a contradiction would be morally corrupt and against public policy. The researcher believes that ‘doing the right thing’ is more justifiable and beneficial to all concerned. Doing what is not morally acceptable means denying future generations of their rights.

The first duty of the present generation is to avoid injuring those of the future. This principle is applicable to all fields/topics and is not merely restricted to the exploitation of nuclear energy. Accordingly, the use of the principle in the medical field and in environmental protection is well noted. According to the principle ‘prevention is better than cure’, there should be earnest, real efforts from mankind to avoid the possible ill effects of unwarranted procedure, by taking all possible steps to reduce them¹⁸⁴. The expected danger from a nuclear power plant is associated with radioactive waste products. There is need for proper treatment of these wastes to avoid burdening the next generation(s)¹⁸⁵. Special methods of treating the nuclear wastes are necessary to prevent injury to the new generations.

The second obligation on the present generation is to protect the welfare of future generations. According to Barry (1998), (from a temporal perspective) “No one generation has a better or worse claim than any other to enjoy the earth’s resources, depletion should be compensated for in the sense that later generations should be no worse off [...] than they would have been without depletion”¹⁸⁶. The other issue would be to

¹⁸³Taebi, B. (2010). ‘The Morally Desirable Option for Nuclear Power Production’, in *Nuclear Power and Justice between Generations - A moral Analysis of Fuel Cycles* (Philip Brey, Peter Kroes and Anthonie Meijerseds), Available at: http://www.ethicsandtechnology.eu/images/uploads/Nuclear_Power_and_Justice_between_Generations.pdf, last accessed on August 28, 2012.

¹⁸⁴ Wingspread-Statement. (1998). The Precautionary Principle.

¹⁸⁵ IAEA (1995) ‘The principles of radioactive waste management’, in *Radioactive waste safety standards programme*, Vienna: IAEA.

¹⁸⁶ Barry B, (1989). ‘The Ethics of Resource Depletion’, in: *Democracy, Power and Justice, Essays in Political Theory*. Clarendon Press, Oxford, pp. 515, 519.

find out a reason why the same amount of resources should be kept for the coming generations. The opinion of Beckerman (1997), that the older generations required lesser fuel than the present generation is noteworthy¹⁸⁷. Additionally, Barry (1998) further opines that the next generation should not be made to face an even worse situation unless it is due to their own fault¹⁸⁸. The argument in favour of this responsibility is that the current generation has the obligation to provide for the coming generation with as much fuel as was necessary for the welfare of the present generation.

The two duties discussed above are the primary responsibilities, which can be replaced with other obligations if required. The confusion that might arise later would be regarding the primacy of one duty over another. There may be circumstances under which the two duties cannot be performed together. If these happen, choosing which of these two duties should be performed over the other would become an issue. Therefore, execution of these obligations further requires the utilisation of new techniques. The duties as described above need to be prioritised, in order to avoid misunderstanding as to which one to fulfil in a situation that demands the performance of one first or only. These duties should therefore be reflected in legal requirements as in the UK Energy Law.

The responsibility to compensate the coming generation for the resources used by the present one is a good moral duty to profess, but in practice it has many problems associated with it. Unlike the conventional resources of power generation, nuclear power generation has various techniques which enable the substitution of the fuel or recycling of the fuel. This would help in alleviating the problems of the future generation to some extent. The present generation has the option to haul out nuclear fuel from sea water or other phosphate deposits, for the reserves to last longer for the coming generations. The changes in technology can benefit future generations by providing different kinds of resources for nuclear power production and, certain techniques during the nuclear power generator processes provide for nuclear wastes which could be used as fuel for further power generation.

¹⁸⁷ Beckerman, W. (1997). 'Debate: Intergenerational Equity and the Environment', *Journal of Political Philosophy* 5 (4), pp.392-405.

¹⁸⁸ Barry B, op.cit.

2.10 Nuclear law and the legislative procedure

Having looked at duties to be acted upon by the present generation in order that future generations will not be adversely affected, it is important to consider what should be done to hold the present generation responsible for any immoral act it may commit. Hence, the need for legislative procedure to guide the present generation is essential. The legislative body has the task of drafting those duties and making defaulters punishable.

2.10.1 Theory of nuclear law

The aim of this section is to analyse issues that could support States in preparing laws which offer sufficient foundations for exploring and exploiting the economic and social gains of nuclear energy and ionising radiation. It is therefore imperative to present a basic theory of nuclear law. To sufficiently attempt this, the following questions need to be addressed: What does nuclear law mean? How is nuclear law different from other features of national and international law? What connection should nuclear law have to other fundamentals of a State's legal structure?¹⁸⁹

However, Heffron, R. (2009) view is that nuclear energy can legally be distinguished from other energy sources. The legislation pertaining to the nuclear sector is different (due to the severity of the sector in terms of potential damage it could cause) and the mechanism of enacting this legislation can undermine the inclusion of synchronisation of legislation across states. This means that such formulation can involve a country's own constitutional and legal mechanisms, cultural traditions, scientific, technical and industrial capacities, as well as financial and human resources¹⁹⁰.

A comprehensive and multifaceted chronological and investigative assessment of efforts in over six decades to develop legal standards following an intricate understanding is therefore examined. Conversely, this attempt is limited to outlining the essential issues that relevant players need to deal with.

¹⁸⁹Stoiber, C., Baer, A., Pelzer, N. and Tonhauser, W, P, (2010). Handbook on Nuclear Law: Implementing Legislation. International Atomic Energy Agency Vienna, 2010. Vienna, Austria.

¹⁹⁰Heffron, R. (2009), "Identifying How Legislation and Regulation Impact Upon the Conditions for New Nuclear Build in the European Union", Proceedings of the International Conference Nuclear Energy for New Europe 2009, Bled, Slovenia.

2.10.2 Definition of nuclear law

Taking the above fundamental aspects into consideration, nuclear law could therefore be regarded as: “The body of special legal norms created to regulate the conduct of legal or natural persons engaged in activities related to fissionable materials, ionizing radiation and exposure to natural sources of radiation”¹⁹¹.

In the above definition, four crucial components could clearly be seen making up a typical nuclear law. Foremost, nuclear law is a set of special legal norms, due to the effects nuclear can cause. It is known to be a fraction of universal or countrywide legislation. It is also comprised of diverse regulations necessary, due to the exceptional nature of technology. Also, the constituent of nuclear regulation integrates the risk-benefit approach, vital to controlling harmful activities which are simultaneously socially and economically advantageous. Thirdly, the specific legal norms relate to the performance of legal individuals, together with business-related, intellectual, systematic and governmental bodies. The last element centres on the production of energy or power using fissionable material or ionising radiation, thus ensuring the law is seen as a special legal system¹⁹².

2.10.3 Objective of nuclear law

It is imperative to emphasise briefly the core reason why a State would decide to promulgate legislation, before trying to classify which aspects of nuclear law differentiates it from other types of law. Basically, the primary purpose of nuclear law is: “To provide a legal framework for conducting activities related to nuclear energy and ionising radiation in a manner which adequately protects individuals, property and the environment”¹⁹³.

Therefore, the primary responsibility of affected authorities or governments is to cautiously consider their nuclear and related activities, as well as their future plans for the

¹⁹¹ See Stoiber, C. et al (2003).

¹⁹² See Stoiber, C. et al (2003).

¹⁹³ See Stoiber, C. (2003).

development of nuclear energy, so that they can sufficiently cover them in the law; this is paramount.

2.11 Legal, regulatory and liability developments regarding nuclear power production

‘The law’ is essentially the society’s desire(s) that has been accepted into legislation. The law also stipulates punishments in case of non-compliance. Therefore, the best method of executing the moral duties of the community is to formulate laws which provide for the performance of such obligations. The moral values previously discussed can be satisfied by formulating laws and regulations. The disposal of nuclear reactive wastes that form as a by-product of electricity production through nuclear power plants requires mandatory and specific rules. International conventions are entered into by the countries involved, in order to formulate such regulations, which bind the signatories to the convention.

The legislation also gives substance to the welfare of the future generation since the effect of a nuclear accident or a leakage in a nuclear plant lasts for generations. The 1986 Chernobyl accident gave the international community an insight into the effects of nuclear accidents. The researcher believes this caused the international community to be careful about the construction, operation and usage of nuclear power plants and nuclear reactors.

More recently, the 2011 Fukushima nuclear crisis alarmed the international community over the extent of damage that can be caused by a nuclear accident. This made the international players explore solutions to the increasing amount of nuclear waste. Since its emergence, mankind has been afraid of the massive destruction potentially caused by a nuclear incident. However, these fears could hamper the development of nuclear power generation all over the globe¹⁹⁴. The age of utilising nuclear energy merely for destructive purposes appears over now. The world is on the threshold of developing economically, medically, culturally and socially, using nuclear energy in various fields. Nuclear energy is now used for the production of electricity and for treatment of various diseases.

¹⁹⁴Hariharan S. (2012). Nuclear Safety, liability and Non- proliferation: a legal insight, IELR 108.

Increased awareness regarding the effect of the emissions from conventional methods of electricity production and the signing of the Kyoto Protocol made the world turn to nuclear energy for such purposes. The very aim of the international convention- to pass on the development from one generation to another - could only be made possible if nuclear energy is harnessed in the correct way. Thus, written law was required, to aid fulfilment of the moral duty to protect the coming generation(s). The researcher therefore admits that the duty of the law itself is a deterrent towards maintaining morals and ensuring that things are done properly, while the enforceability of the law makes it more coherent and considerate.

Article II of the IAEA Statute provides for the use of nuclear power to be performed in a way that peace, health and development of the world is safeguarded¹⁹⁵. It also envisages that nuclear energy should not be used for the use of weapons or for mass destruction. The subject of legal structure around the globe include the use of nuclear energy in a secure way; safeguards from radiation; disposal of nuclear wastes; the safe mobilisation of nuclear materials; training on how to deal with emergency situations; responsibility for the injury caused by radioactive materials; the secure handling of radioactive materials; protection of areas with nuclear active materials; commercial transaction of nuclear materials and the decommissioning of nuclear power plants¹⁹⁶. The safeguarding of human beings from being exposed to nuclear active materials is one of the prime concerns of the international community. The radiation from nuclear active materials causes damage to human tissues, even if the radiation level is exceedingly low. Health injuries that can be caused by nuclear materials may potentially be passed on to future generations. Hence, the moral obligation to protect the interests of the future generation is addressed by the legal framework.

The United Nations Organisation (UNO) has formed the IAEA to formulate regulations for the preservation of Safety Standards for the protection from radiation. The objective

¹⁹⁵“The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world. It shall ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose.”

See: International Atomic Energy Agency (IAEA), (2015). The mandate for the IAEA’s technical cooperation programme is drawn from Article II of the IAEA Statute. Vienna: Austria. [Online]. Available at: <https://www.iaea.org/technicalcooperation/programme/policy-context/IAEA-Statute/index.html> Accessed on 13/08/2016.

¹⁹⁶Hariharan S. (2012). op. cit.

of Basic Safety Standards (BSS) is to safeguard mankind from the results of radiation, while the steps to be taken for safeguarding the environment do not exist in the regulations¹⁹⁷. It provides for the utmost amount of radiation that is permissible for human beings and the maximum amount of such materials that can be stored¹⁹⁸. There are provisions to keep monitoring facilities to measure the level of radiation emitted from a radioactive source. The holder of the radioactive material is expected to have power over the emission(s). This suggests a gap in the law, as a single international instrument should provide for the safety measures that are to be followed by every operator who uses nuclear materials, in order to ensure the whole world is equally protected.

There are regulatory measures adopted by the IAEA on the nuclear power plants. It mainly deals with the effects of the nuclear materials on the environment¹⁹⁹. According to sub-programme 1.1 Basic Nuclear Safety and Criteria the aim was “to examine current safety issues and to propose solutions for them with a view to establishing commonly shared safety principles and objectives... and to advise on safety policy and criteria in order to ensure a consistent approach to nuclear safety compatible with evolving radiation protection philosophy and criteria.”²⁰⁰ The IAEA safety regulations addressed the issues of constructing the nuclear power plant; the external hazards of nuclear plants; the defects in the design of the power plants; the effects of the power plant due to the passage of time; keeping a record of events that have safety concerns and also certain rules regarding the security of the nuclear power plants²⁰¹.

The Hazardous Material Transportation Act was the outcome of the efforts of the United States Congress of 1975 to stipulate standards for the mobilisation of materials that are radioactive. It authorises the Department of Transport (DOT) to protect mankind “against the risks to life and property which are inherent in the transportation of hazardous materials in commerce.”²⁰² On the international level, the IAEA has made the Regulations

¹⁹⁷International Atomic Energy Agency, (1982). *Basic Safety Standards for Radiation Protection*. Safety Series No.9, foreword.

¹⁹⁸Ibid. International Atomic Energy Agency, (1982).

¹⁹⁹ International Atomic Energy Agency, *Environmental Aspects of Nuclear Power Stations* (1971) Proceedings Series STI/PUB/261.

²⁰⁰International Atomic Energy Agency (1990). The Agency's Programme and Budget for 1991 and 1992 XVII-XXI (1990).

²⁰¹ International Atomic Energy Agency, International Atomic Energy Agency Illicit Trafficking Database, see: <http://www-ns.iaea.org/security/itdb.htm>, last Accessed August 7, 2012].

²⁰² Michele Mattsson (1988). “Transportation of Radioactive Materials in Our Backyards--A State's Perspective” 9 J. Energy L. & Pol’y 47.

for the Safe Transport of Radioactive Material to govern the mobilisation of radioactive materials²⁰³. To deal with this, the UAE has made The United Arab Emirates Regulations for Safe Transport of Radioactive Materials [UAE RSTRM (56/2004)]. The UK also has the 2002 No. 1093 Atomic Energy and Radioactive Substances (The Radioactive Material (Road Transport) Regulations 2002). Regulations governing the transport of radioactive material in these countries are based on standards developed by the IAEA. The researcher observes that IAEA regulations are prescriptive and apply internationally to enable the safe transport of packages across international borders.

The business of radioactive materials is governed by the General Agreement on Tariffs and Trade (GATT). In addition to the standards set forth by GATT while trading internationally, radioactive materials which are used for trade need to pass the requirements of national security and environmental protection²⁰⁴.

Apart from the safety standards that need to be followed internationally, there are certain basic principles of law that are followed while determining the liability in case of a nuclear accident. The international law recognises the right of the victim to claim damages from the person liable for the nuclear accident. It further makes the operator of the nuclear power plant strictly liable for any damage that is caused by the running of the nuclear power plant. International treaties, such as the Paris Convention, envisage that the operator alone is exclusively liable for the damage caused by the nuclear power plant and it cannot be blamed on defects in construction or design. This principle is applicable to the non-signatories of the Paris Convention by the 2004 Protocol which amended the Paris Convention. The Vienna Convention similarly makes the operator liable for the damage caused by nuclear accidents.

Traditionally, there has been a two-tier system regarding liability, since most countries maintain a system at both national and at international levels. The scope of liability of the operator is also not definite, since the international instruments have bestowed only restricted liability, while national level laws have provided unlimited liability regarding

²⁰³ International Atomic Energy Agency (IAEA) (2005). Safety Standards Regulations for the Safe Transport of Radioactive Material. Safety Requirements No. TS-R- [online]. Available: http://www-pub.iaea.org/mtcd/publications/pdf/pub1225_web.pdf Last Accessed August 24, 2012].

²⁰⁴ See Hariharan S., op.cit.

the operator of a nuclear power plant. From victims' viewpoints, the national laws which permit unlimited liability are a welcome move, because the original victims are not the only ones that suffer as injury might also be passed on through to their future family generations. Such injury cannot be compensated for in solely monetary terms but by also ensuring that adequate measures are put in place to check reoccurrence and avoiding adverse effects on future generations.

Since the operator will be exclusively liable for any nuclear reactor mishap occurring, there should be a strong insurance contract for the operator. The insurance contract in a nuclear power plant is usually provided by a group of companies and is not limited to a sole company. The liability to indemnify the victim will be in proportion to the risk insured. The radiation in the international level is exempted from the purview of the insurance contract while it also excludes the right of subrogation. This right is removed from an insurance contract with a nuclear power plant with the intent to satisfy the strict and exclusive right of the operator, in case of a nuclear accident. In order to cover the risks involved while transporting the nuclear reactive materials, the person liable during such transit must obtain a document from the insurer with all the details of the materials transported and the amount of money on hand to pay for the claims.

There are international instruments to control the production of nuclear weapons around the globe but there is no international practice which regulates the manufacture, carrying or expansion of arms²⁰⁵. Recently however, there have been developments in international laws which control the use of arms and their production. The Vienna Convention on the Law of Treaties governs the interpretation and execution of treaty provisions, while the Convention on Disarmament aims at restricting the addition of arms to those already existing and limiting the desire for arms development in neighbouring countries²⁰⁶.

The UNO has different structures which are aimed at protecting international peace by controlling the proliferation of nuclear weapons. The General Assembly of the UNO “may consider the general principles of co-operation in the maintenance of international

²⁰⁵ Military and Paramilitary Activities (*Nicar v US*), 1986 I.C.J. 135 P 269.

²⁰⁶ Harald Müller, David Fischer and Wolfgang Kötter (1994). Nuclear Non-Proliferation and Global Order 2-4; Jörn S. Harry, IAEA Safeguards and Non-Proliferation, in the Future of the International Nuclear Non-Proliferation Regime (1995)167, 168.

peace and security, including the principles governing disarmament and the regulation of armaments, and may make recommendations regarding such principles to the Members or to the Security Council or to both”²⁰⁷. On the other hand, the Security Council “shall be responsible for formulating ... plans to be submitted to the Members of the United Nations for the establishment of a system for the regulation of armaments”²⁰⁸.

With the increased awareness of the international community regarding the effects of nuclear radiation, there was a Disarmament Commission set up between Canada, France, UK, USA and USSR aiming to reach a consensus toward ending nuclear tests. The result of these discussions was the signing of the Test Ban Treaty (TBT) in the year 1963. The Test Ban Treaty bans “any nuclear weapon test explosion, or any other nuclear explosion” in the atmosphere, in outer space, under water and “in any other environment if such explosion causes radioactive debris to be present outside the territorial limits of the State under whose jurisdiction or control such explosion is conducted.”²⁰⁹ Regrettably, the TBT could not be passed with the provision for disarmament due to failure in reaching a compromise. Thus, the treaty was ratified without provisions of disarmament, in 1996²¹⁰.

The intentions of the member states to this treaty were different. When the states which already have nuclear weapons wanted to restrict the development of nuclear weapons by other countries, some of the other Member States wanted to ensure that they would not be attacked by other countries with nuclear weapons. The anxieties of some of the nations led to the signing of the Non-Proliferation of the Nuclear Weapons Treaty, popularly known as NPT. The NPT exempts the five permanent members of the Security Council who already have nuclear weapons and can keep them, yet restricts other countries from manufacturing or augmenting nuclear arms²¹¹. The researcher observes that there is no justification for such exemptions. If the aim of NPT is to prevent Member States from harnessing weapons of mass destruction from their nuclear programmes, then there

²⁰⁷ UN Charter Article 11.

²⁰⁸ Ibid, Article 26.

²⁰⁹ Treaty Banning Nuclear Weapon Test in the Atmosphere, in Outer Space and under Water, UK, USSR, US, August 8, 1963, 480 U.N.T.S. 43 (hereinafter TBT). See Allan Gotlieb, *Disarmament and International Law* (Canadian Institute of *Page15* International Affairs, 1965), pp.28-32, 44-50.

²¹⁰ S.C. Res. 50/245, UN Doc. A/RES/50/245

²¹¹ Gabriella Venturini, (2001). “Control and Verification of Multilateral Treaties on Disarmament and Non-Proliferation of Weapons of Mass Destruction”. 17 U.C. Davis J. Int’l L. & Policy 345.

should not be exemptions given to some Member States. Rather, all Member States must abide by the objectives of the Treaty and develop peaceful nuclear energy programmes.

The legal framework that covers the nuclear energy industry is wide and encompasses almost all the possibilities of nuclear energy. It also has loosened its hold on the purposes of nuclear energy, in order to develop investment in the development of nuclear power generation and the use of nuclear reactive materials in the medical and other fields.

The next step would be considering the whole world as a single unit, to provide for an international legal framework alone and to forgo national legislations. Although the existing international law is adequate to provide for the disposal of nuclear wastes and define the liability of operator for damage caused by nuclear reactors. The unification of the IAEA and the World Trade Organisation (WTO) in the matter of nuclear energy can help in realising a single market to enable better ability to transact the nuclear waste. Since security and safety is the primary concern of the international community, it is highly desirable to develop trade and commerce in nuclear materials that are fully covered by strict provisions to prevent negative impacts. The author suggests that it should also be ensured that nuclear materials are with persons who are accountable or could be held responsible in case the materials are misused. Therefore, the safety of nuclear power reactors can be enhanced through the deployment of professionally trained persons.

2.12 National legal hierarchy

Essentially, it is normal that permissible standards for the regulation of nuclear energy form part of a sovereign State's common legal structure²¹². Hence, nuclear law should be positioned in the common legal hierarchy appropriate in most States. This hierarchy consists of a number of levels. The first, which is the constitutional level, introduces the basic institutional and legal arrangements governing all relationships in the State. The statutory level is second level. In this level, specific laws are made by the legislature to institute other obligatory bodies and to implement processes having to do with a range of

²¹² Ibid Stoiber, Carlton et al (2010).

activities having to do with State interests, for example the UK and UAE legal hierarchy²¹³.

Detailed regulations which are highly technical rules are contained in the third level, basically to control those actions indicated by legal instruments. Due to the nature of these rules, they are usually developed by expert bodies (including bodies nominated as strict establishments)²¹⁴. These bodies can direct precise parts of national interest. They are formed in agreement with the national legal structure. The next level which is the fourth consists of non-compulsory guidance instruments. These instruments are recommendations intended to assist persons and organisations to meet legal needs²¹⁵. The UK is an example of countries where there are various pieces of legislation within its energy law. The author suggests that UAE could adopt similar measures within its own legal hierarchy.

It is possible that the use of nuclear knowledge can engage the application of a wide variety of laws which mainly recount to other subjects²¹⁶. It depends on the kind of nuclear activities a nation wants to permit; generally, the difference in the common framework of national legislation should be customary only where the character of an activity warrants extraordinary action. It is therefore pertinent to note that, it should not be obligatory to enact new legislation to the level that a nuclear related activity is adequately covered in other laws. Yet, from the inception of the development nuclear energy law, nuclear energy has been considered to involving exceptional legal arrangements to guarantee that its proper management.

2.13 Risks and benefits

Factually, nuclear energy poses unusual risks to the health and safety of persons and to the environment, which must be cautiously controlled. However, nuclear material and technology also guarantee significant benefits in different ways including medicine, agriculture, electricity production and industrial development. It would therefore be

²¹³ Ibid Stoiber, Carlton et al (2010).

²¹⁴ Ibid Stoiber, Carlton et al (2010).

²¹⁵ Ibid Stoiber, Carlton et al (2010).

²¹⁶ These include protection of the environment, industrial safety, land use planning, administrative procedure, mining, transport, government ethics and the regulation of electricity rates.

prudent to articulate that any human activity involving no more dangers than benefits entitles a legal system of proscription rather than guideline. Thus, a fundamental feature of nuclear energy law is its dual focus on risks and benefits²¹⁷. The benefits of nuclear energy in the UAE are fully discussed in the next Chapter Three of this thesis.

2.13.1 Risk

Using the USA as an example, one of the Nuclear Regulatory Commission's (NRC) principal tasks is to make sure that Probabilistic Risk Assessment (PRA) is maintained. PRA steadily looks at how pieces of a modern PRA use several definite techniques to achieve this analysis. The NRC uses Probabilistic Risk Assessment (PRA) to estimate risk by computing real numbers to determine what can go wrong, how likely is it, and what are its consequences. Thus, PRA provides insights into the strengths and weaknesses of the plan and operations of a nuclear power plant²¹⁸

The determination of risk is dependent on two factors. These include: How frequent a certain hazard may arise; and the amount of harm such hazard could cause?²¹⁹ The author maintains that risk can be reduced by making a detrimental occurrence less probable or by making its result less severe. PRA is used as one approach to assess general risk particularly in the nuclear industry. This reminds us of the legal concepts of duty - the need to do what is required by the law so that actions will not bring about negative impact on the system. These actions should be positively beneficial to both the present and future generations.

2.13.2 Risk assessment methods

There are various methods of carrying out risk assessment. Different steps are employed to achieve a PRA. The foremost thing to do is to identify the hazard to be prevented. Core damage is normally used for hazards from nuclear power plants. The core contains the fuel and forms the initial physical barrier between the radioactive process and the host

²¹⁷ See Stoiber, C., et al, (2010).

²¹⁸United States Nuclear Regulatory Commission (USNRC), (2013). Probabilistic Risk Assessment (PRA). [Online]. Available at: <http://www.nrc.gov/about-nrc/regulatory/risk-informed/pr.html> Accessed 03-02-2015.

²¹⁹See United States Nuclear Regulatory Commission (USNRC), (2013).

community. The second step is to identify the initiating events that could probably cause harm. Thirdly, the regularity of each initiating occurrence is then determined. The next step is the estimation of the tenability of the occurrence, followed by the identification of the blend of chances of failures leading to consequences, if the initiating incident has occurred²²⁰. The researcher posits that this is a reasonable foresight within legal concepts of duty.

After considering the above steps, the calculation of the probability of each permutation is then carried out, while the likelihood of all the sequences that leads to similar effects is totalled. To discover how frequently this outcome might take place, these likelihoods are multiplied by the regularity of the initiating event(s).

To accomplish the above analysis, present PRA applies numerous precise procedures. These include the (Event Trees²²¹, Fault Trees²²², Human reliability analysis²²³ and Monte Carlo methods²²⁴).²²⁵. These relate to the acceptable approach to PRA.

A sample of Probabilistic Risk Assessment (PRA) can be shown in Diagram 6 below. The researcher therefore suggests that UAE should consider adopting this model in assessing possible risks involved in its nuclear power developments with the view that it will help in the reduction of risks in its nuclear projects.

²²⁰Ibid United States Nuclear Regulatory Commission (USNRC), (2013).

²²¹*Event trees* model the plant response to each initiating event.

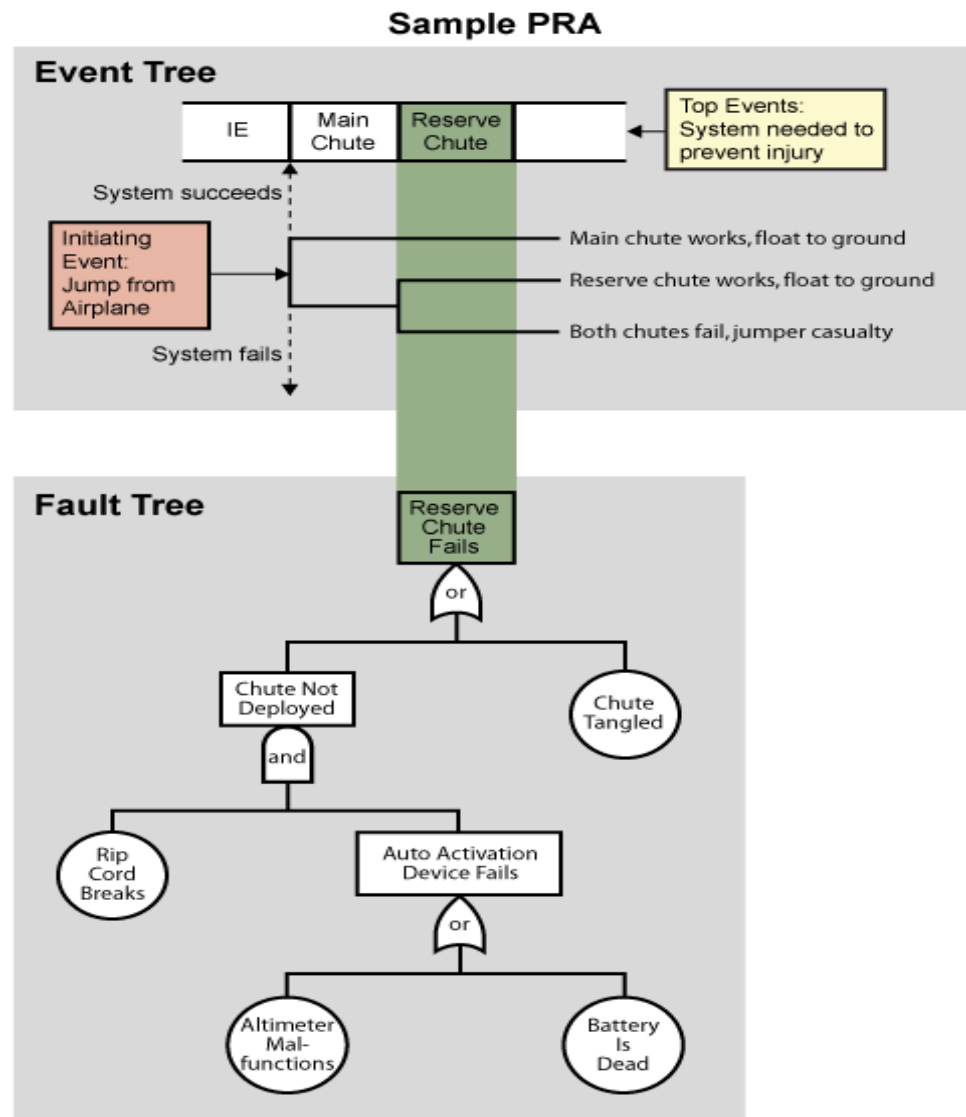
²²²*Fault trees* model plant systems in detail. Analysts use fault trees to identify the combinations of failures that cause the overall system to fail. Then, the fault tree logic is used to calculate the overall failure probability. Analysts pay attention to problems that can fail more than one component at the same time.

²²³*Human reliability analysis* (HRA) is used to evaluate human errors that are important to the outcome of an event. Analysts assess the probability of a mistake considering factors like training, procedures, and expected conditions during an event.

²²⁴*Monte Carlo* methods are used to compute the risks. This technique allows analysts to consider variations in each factor of the analysis, imperfect knowledge, as well as the many possible ways the factors can interact.

²²⁵ See United States Nuclear Regulatory Commission (USNRC), (2013).

Diagram 6: Sample of Probabilistic Risk Assessment (PRA)



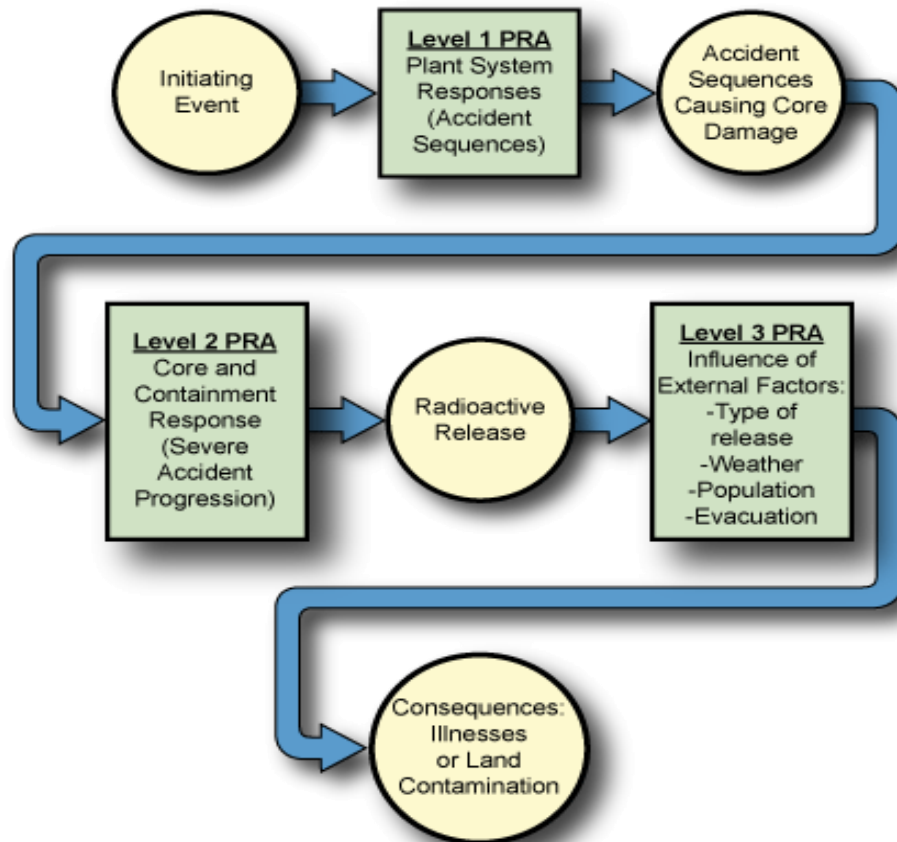
Source: United States Nuclear Regulatory Commission (USNRC), (2013)

2.13.3 Types of risk assessments

Preparing an essential PRA model may take lot of effort. The use of modern information gadgets, for example the computer, makes it easier to apply or alter every PRA model and test several different scenarios. The United States Nuclear Regulatory Commission (USNRC) posits that the PRAs of most ordinary nuclear power plants deal with ‘internal events’ which occur within the plant, while for ‘external events’, the PRAs operate by means of initiating events, examples include earthquakes and hurricanes. It is also important to note that special PRAs are used to tackle exclusive problems, such as spent nuclear fuel storage cask design or the geology of a prospective depot for high-level

radioactive waste. USNRC maintains that in the nuclear power industry, analysts label PRAs by level^{226,227}. These levels of PRA are illustrated in Diagram 7 (see next page).

Diagram 7: Levels of Probabilistic Risk Assessment (PRA)



Source: United States Nuclear Regulatory Commission (USNRC), (2013)

²²⁶ See: United States Nuclear Regulatory Commission (USNRC), (2013). *The levels are as follows:*

a. **A Level 1 PRA** estimates the frequency of core damage. It starts with conditions that are well known, usually with a reactor operating at full power. All the systems that work to protect the reactor are modelled. Since the workings of these systems are well understood, the uncertainty of the result is relatively small.

b. **A Level 2 PRA** estimates the magnitude and timing of releases. (That is, “If the core is damaged, how much radioactivity might escape into the environment?”) Uncertainty associated with how much coolant escapes the reactor systems (and how violently), as well as variation in containment system response, makes a Level 2 PRA less precise than a Level 1 PRA.

c. **A Level 3 PRA** assesses the injuries and economic losses that might result if radioactivity escaped from containment (What can go wrong, how likely is it, and what are the consequences?). Highly variable factors like wind speed and direction will affect the results.

²²⁷ See United States Nuclear Regulatory Commission (USNRC), (2013).

Looking at a different jurisdiction, there have been a series of ambiguities on the feasibility of the Civil Nuclear Liability for Damage Act 2010. For example, India: the Kudankulam Nuclear Power Project (KNPP) in Southern India, which through Parliament raised a debate concerning the Act. Similarly, the 2011 Fukushima nuclear accident in Japan motivated public apprehension about nuclear security in India²²⁸. Although campaigning against the project was limited, it subsequently gained resolute support by civil society groups referring to safety cooperation on a variety of technical factors.

Even though the government set up professional committees to moderate any concerns, the case was disputed before the Madras High Court, then to Appeal before the Supreme Court of India²²⁹. While the Madras High Court assured the security and legitimacy of the project, the Supreme Court of India endorsed the observation, with additional instructions, determining the superiority of expert committees who unanimously concluded the project was safe.

Since KNPP was a project of national importance, both the Madras High Court and the Supreme Court of India came together to defend its integrity. The Central Information Commission even ordered that the KNPP project site and safety evaluation reports be made accessible to the public. Opposing this however, the Nuclear Power Corporation pleaded with the Delhi High Court, claiming that such information was proprietary, successfully acquiring a stay order²³⁰.

The essence of this section is to further remind Member States and operators of nuclear power projects regarding the need to perform their responsibilities, taking into consideration relevant standards in the sector. This will go a long way toward minimising possible risks potentially emanating from nuclear power plants. From the above analysis, it could be deduced that although laws have been made to guide the harnessing of nuclear power to ensure good practice and conformity, there may still be situations where lapses occur despite the laws. Should this occur, Member States could seek expert opinion to

²²⁸ Ram Mohan, M. P. and Shandilya, Akshay (2014). Nuclear Energy and Risk Assessment by Indian Courts: Analysis of Judicial Intervention in the Kudankulam Nuclear Power Project (May 16, 2014). *Journal of Risk Research*, 2014; DOI: 10.1080/13669877.2014.913665. Available at SSRN: <http://ssrn.com/abstract=2437833> Accessed on 18-12-2014.

²²⁹ See Ram Mohan, M. P. and Shandilya, Akshay, 2014.

²³⁰ See Ram Mohan, M. P. and Shandilya, Akshay, 2014.

cope with issues? The researcher expresses knowledge is not stagnant but evolutionary; new knowledge when tested becomes acceptable and can be exploited for good purposes. In this way, the UAE can gain from the above analysis, utilising it toward further ensuring a successful nuclear energy programme.

2.14 Summary of Chapter Two

Chapter Two provided an understanding of the international civil nuclear liability regimes with special focus on the way in which the UAE is approaching its nuclear programme. It traced the development of the nuclear regimes the world over, starting with the Paris (1960) and the Vienna (1963) Conventions. In the early 1950s, the civil use of the nuclear fission process was hailed by many Western Nations as an economically viable and environmentally friendly source of electricity generation. This utopia soon diminished, with the occurrences of nuclear accidents in the United States (Three Mile Island, 1979) and Europe (Chernobyl, 1986). The changing public opinion vis-à-vis nuclear reactors led to a decline in the establishment of nuclear plants.

Nuclear renaissance has to do with the increase of the production of energy through nuclear sources. This has been proposed to enable countries to invest in a more economic and safer means of energy production to tackle climate change. Nuclear renaissance is affected by a number of factors, which have posed huge risks in the sector, thus increasing the amount of possible liabilities. The use of nuclear energy by countries is often suspected by the international community for fear that it may also entail the production of deadly weapons, which will affect both present and future generations. In view of this, the use of nuclear energy requires strict planning and implementation.

The international community is apprehensive about more states possessing nuclear energy, especially after the nuclear accidents in power plants like Chernobyl and Fukushima. The augmentation of nuclear power is viewed suspiciously globally. The effects of nuclear incidents endure for more than a generation and are appalling. Thus, the international community is wary before allowing a member State to start a nuclear programme. Those countries which already own nuclear weapons are not interested in allowing others to augment their own nuclear weaponry for fear of being attacked themselves. Restrictions on the possession of nuclear weapons are beneficial for the

international community therefore, since the uncontrolled use of nuclear power would mean increased competition amongst the member States. One of the most important uses of nuclear energy is for the cheapest production of electricity. This meets the Middle East's demand, which is rising by 9 percent annually. More conventional methods are incapable of providing for such an increment in demand for electricity.

However, the present generation find the moral issues more daunting than the legal. The power generation through nuclear energy is to satisfy the increasing needs of the present generation, but this type of power generation produces nuclear wastes that remain for more than 10,000 years and will affect the coming generations. So, it is argued that the current generation has a duty towards that of the future to protect them from the ill effects of the luxury the present generation enjoy. The researcher emphasises that the current generation has a responsibility to protect the future population's welfare whilst simultaneously undertaking that no harm is caused to those generations to follow. Many authors of the relevant literature argue that the duty not to harm the coming generation is awarded more importance than the responsibility to protect the welfare of the future population.

It appears a difficult task perhaps, to protect the future generation whilst providing for the current. Such a dilemma requires a solution that may be achieved by using different methods of nuclear power production. It can be attained to some extent by using a reactor which can reuse the nuclear fuel, thus reducing the nuclear wastes. Partitioning and transmutation is one method which reduces nuclear waste production. Such a reactor can cater for the current generations' increased power and meanwhile, reduce the quantity of nuclear waste produced, which in turn reduces the potential harm to the future populace.

The legal and regulatory frameworks provide for the moral needs of the society. The standards of safety and security as provided for by the IAEA strive to achieve the safest method of operation for nuclear power plants. The legal and regulatory frameworks provide for strict liability to the operator, which suggests that operator(s) will be vigilant in taking measures to prevent any accident or leakage in the nuclear power plant that would affect the Earth's future inhabitants.

The use of nuclear energy for peaceful purposes is not restricted by any international convention or treaty. Plus, the dangers surrounding implementation of nuclear energy and its possible misuse are overwhelming, potentially devastating. This has made the international community extremely sceptical regarding the use of nuclear energy even for peaceful purposes, since high levels of safety and security measures are required to avoid possible hazards. It is also necessary to be mindful of the future generation while yet encouraging the use of nuclear energy for producing power or for other peaceful purposes.

While the UAE wants to acquire nuclear energy, it is not without strategic constraints for possessing the same. This chapter considered some of the reasons the UAE has stated for enjoying nuclear energy and the limitations therein. The next chapter explores in detail, the motivation for possessing nuclear energy and the challenges that UAE is likely to face in obtaining nuclear energy.

CHAPTER THREE

UAE's MOTIVATION TO POSSESS NUCLEAR ENERGY AND FUTURE STRATEGIC CONSTRAINTS

3.1 Introduction to Chapter Three

This Chapter considers the UAE as a sovereign state, its motivation and preparedness for controlling nuclear energy in relation to current social and political developments. It also analyses the UAE's motivation for the possession of nuclear energy and the constraints the country would face in implementing its nuclear power programme. The socio-economic and political benefits of a nuclear energy programme to the UAE are evaluated too. The Chapter then critically analyses issues of construction and operation of nuclear power plants, in terms of financing, legalities and liabilities considerations and so forth. While the local and international legal concerns regarding developing even a peaceful nuclear programme are likewise discussed in this chapter, the possible expectations of the international community and of the UAE for embarking on nuclear power projects are similarly evaluated. Therefore, the thesis is aimed at determining the nature and scope of potential liabilities in the UAE's nuclear energy programme, as well as how they could be addressed.

The Chapter subsequently discusses the incentives behind the UAE's private ownership of nuclear power production. It also looks at the limitations the country is likely to encounter in carrying out such projects. This is a follow up of the justifications for the UAE's development of nuclear energy programmes outlined in the preceding Chapter Two. Although the country has been very positive about the programmes, there are some important issues that need to be considered to make it sustainably successful.

3.2 UAE: its motivation to possess nuclear energy and future strategic constraints

According to Abdullah bin Zayed Al Nahyan, the UAE's Foreign Minister, the main aim of government, in seeking to develop nuclear energy, is: "To develop a model for the deployment of nuclear energy that is based on the highest standards of operational

transparency, safety, security, and non-proliferation, as well as the principles of long-term sustainability and cooperation with the IAEA and responsible nuclear supplier states.”²³¹ These objectives will be assessed to determine the validity of the UAE programme.

The need for harnessing nuclear energy was felt in the UAE when the demand for electricity increased²³². The country plans to establish four nuclear power plants by the year 2020, once the Gulf Co-operation Council (GCC) initiates studies on nuclear power plants²³³. Members of the GCC - Kuwait, Saudi Arabia, Bahrain, the UAE, Qatar and Oman, have commenced their research on the exploitation of nuclear energy for useful purposes, including the production of energy²³⁴. This is facilitated by France, while Iran also agreed to provide technological support²³⁵. The GCC produces a total of 273 billion kilowatts of electricity in a year, but this is from non-renewable resources and there is an upsurge in the requirement of electricity in the range of 5 to 7 percent per year²³⁶. According to the reports in 2009, the demand for power was increasing at the rate of 10 percent every year, while the need for desalination was rising at the rate of 8 percent, which requires the installation of a plant that can generate enough energy to meet the countries requirements²³⁷.

Most authors’ and the government’s published papers²³⁸, have projected an increase in the need for electricity in the future, hence the reason for generating nuclear power for electricity²³⁹. Some authors have opined that the decision to exploit nuclear energy is purely political and an effort to challenge countries; examples of these countries are Iran and Israel, which have already utilised nuclear energy²⁴⁰. The use of nuclear energy is

²³¹ Bin Zayed Al Nahyan, 2008 cited in Dr. Bryan R. Early, ‘Export Control Development in the United Arab Emirates: From Commitments to Compliance, BelferCenter for Science and International Affairs, Harvard Kennedy School, July 6, 2009.

²³² Christian Blanchard, op.cit.

²³³ World Nuclear Association, ‘Nuclear Power in the United Arab Emirates’, Available at http://www.world-nuclear.org/info/UAE_nuclear_power_inf123.html , Last accessed on 5-8-2012.

²³⁴ Ibid. World Nuclear Association.

²³⁵ Christian Blanchard, op.cit

²³⁶ Ibid. Christian Blanchard, op.cit

²³⁷ Ibid. Christian Blanchard, op.cit

²³⁸ Forum on Energy, (2013). Future of Nuclear Power in Emerging Markets: United Arab Emirates. September 9, 2013. [Online]. Available at: <http://forumonenergy.com/2013/09/09/future-of-nuclear-power-in-emerging-markets-united-arab-emirates/> Accessed on 17/08/2016.

²³⁹ Ali Darwish, ‘We Need a Long-Term Advocacy Strategy Towards a Nuclear Free Region’, Layla Al-Zubaidi, Joachim Paul, Doreen Khoury(eds.) in Heinrich Boll Stiftung, ‘Nuclear energy and the Arab World’, Perspective 1 April, 2011.

²⁴⁰ Ibid. Ali Darwish.

also an indication of development and modernisation according to the countries in the Middle East,²⁴¹ as previously discussed above in presenting the philosophical and ethical justifications for the UAE's nuclear programme.

Nuclear power generation it was realised, is probably the best option for generating the required energy and when compared to other sources, is reasonably environmentally friendly and cheaper²⁴². Not only was nuclear energy capable of producing the ever-increasing amount of electricity to meet the people's requirements²⁴³, it was also considered to be the most commercially viable method of electricity production, because of the large quantities of power generation capabilities, combined with the fact that no non-renewable natural resource is being used, thereby making it a very attractive option for power generation²⁴⁴. The UAE intends to run 14 nuclear power plants in the country, with four of them expected to be fully functional by 2020²⁴⁵. These four nuclear power plants are currently forecast to be located in Abu Dhabi, Al Fujayrah and As Sila²⁴⁶. The nuclear power plant in As Sila is to provide electricity for Qatar and Bahrain.

There have been various grounds put forth by those advocating the use of nuclear energy in the UAE²⁴⁷. It is believed that the programme will bring about an increase in employment opportunities which can foster development in the financial sector. The programme will enable the steady production of electricity to meet the country's ever expanding requirement for power. The implementation of nuclear power production will relieve UAE's reliance on other nations for its electricity supply. The programme will enable the production of electricity with reduced environmental impact whilst preserving non-renewable energy resources. The country aspires to develop technologically, acknowledging the programme will attract technological know-how from other nations²⁴⁸.

²⁴¹ See Ali Darwish

²⁴² Vincent Mulvey, *op.cit.*

²⁴³ World Nuclear Association, *op.cit.*

²⁴⁴ *Ibid.* World Nuclear Association, *op.cit.*

²⁴⁵ *Ibid.* World Nuclear Association, *op.cit.*

²⁴⁶ Christian Blanchard, *op.cit.* and World Nuclear Association, *op.cit.*

²⁴⁷ Dennis Kumetat, *op.cit.*

²⁴⁸ See: Dennis Kumetat, *op.cit.*

Concurring with a suggestion made by the IAEA, the UAE founded a Nuclear Energy Programme Implementation Organisation²⁴⁹. This organisation institutionalised the Emirates Nuclear Energy Corporation (ENEC) to a cost of \$100 million²⁵⁰. The Corporation was to assess and execute the nuclear energy programmes in the UAE.²⁵¹ The plan was to provide for Abu Dhabi which is the biggest city in the country while others will follow.

The country's intention is to establish the nuclear energy plants in collaboration with foreign capital²⁵². The plants for production of electricity and water already functioning in the country have most shares owned by the government with the rest held by Joint Venture partners²⁵³. The UAE will also use foreign technology and contractual services to run the plant while discouraging the use of its nationals and knowledge. Perhaps this will further reduce potential liabilities that may arise from sub-standard operations.

The UAE's plan is to ensure safe provision of fuel for electricity production, coupled with secured methods of nuclear fuel transportation and waste disposal methods that will not affect the environment²⁵⁴. Again, this effort will minimise risk of liabilities in the programme, which form the aims and objectives of the study.

The UAE's policy regarding the evaluation and potential development of peaceful nuclear energy was established by its government in 2008. The main objectives of the policy were to emphasise the need for transparency in nuclear-related activities and to discourage the re-use of spent fuel, in order to adhere to the non-proliferation standards [the Non-Proliferation Treaty (NPT) which provides the basic legal right of states to develop nuclear energy programmes]²⁵⁵ as previously discussed as part of the philosophical and ethical issues vis-à-vis the nuclear power programme (see Chapter Two above).

²⁴⁹ UAE Government, '1st National Report on Measures Taken by the United Arab Emirates to Implement the Convention on Nuclear Safety', August 2010.

²⁵⁰ Ibid. UAE Government Report 2010.

²⁵¹ See UAE Government Report 2010.

²⁵² Ibid. UAE Government Report 2010.

²⁵³ See UAE Government Report 2010.

²⁵⁴ Ibid. UAE Government report 2010.

²⁵⁵ Nuclear Policy statement. Available at: http://fanr.gov.ae/ar/media/get/20090430_uae-policy-white-paper.pdf Last accessed on 24th August, 2012.

The building of the nuclear power plants was to be decided via a bidding process; from nine companies a shortlist of three were selected. Areva, GE-Hitachi and the Korean consortium were the major contenders²⁵⁶. The Korean consortium led by the KEPCO won the bid for the construction of the four power plants [see Appendix 3 (Certificate of Competent Authority for Radioactive Package Design) and Appendix 4 (License for the Construction of a Nuclear Facility)]. The operation of the reactors of the first phase is expected to yield a profit of 20 billion dollars for the Korean consortium, over a span of more than 50 years²⁵⁷. The Korean consortium won the bid on the basis it promised less time required for constructing the power plants, offered the greatest capacity, combined with the lowest production costs²⁵⁸. The expenditure on electricity production is expected to be one quarter of the cost of production from other sources. The UAE also plans to sell power outside its borders²⁵⁹. Minimising costs can allow for a greater use of resources elsewhere. Thus, the UAE will economically gain from those nations bordering it.

Later, an assessment of the impact of the nuclear power plant that was to be set up in Abu Dhabi was done and approved by the Environmental agency in July 2012²⁶⁰. This is to consider possible damages that nuclear energy production may cause to the environment and living things. The Federal Authority of Nuclear Regulation (FANR) assessed the location for the four nuclear power plants in the UAE²⁶¹.

The evaluation of the locations was based on rules laid out by FANR. It included six different locations for comparison and evaluation of their suitability for the four reactors²⁶². This assessment was based upon the guidelines of the United States Electric Power Research Institute (USEPRI), as well as those of the United States Nuclear Regulatory Commission (USNRC) and the IAEA²⁶³. FANR granted licences (see Appendices 3 and 4) to ENEC, approving the site at Barakah and a licence which limits the construction affecting the permission to produce important components for the four

²⁵⁶ UAE Government Report 2010.op.cit.

²⁵⁷ Ibid. UAE Government Report 2010.

²⁵⁸ H. E. Ambassador Hamad Alkaabi, Statement of the United Arab Emirates - 'International Atomic Energy Agency', at the 55th General Conference of the International Atomic Energy Agency.

²⁵⁹ Ibid. IAEA.

²⁶⁰ Ibid. IAEA.

²⁶¹ See UAE Government Report 2010.

²⁶² Ibid. UAE Government Report 2010.

²⁶³ Fischer David, History of the International Atomic Energy Agency: the first forty years by David Fischer. Vienna: The Agency, 1997.

nuclear power plants²⁶⁴. A licence that certifies the construction without any impact on the environment was also granted to the ENEC. This followed the commencement of the construction works of the plant in 2011²⁶⁵.

Furthermore, construction permits were applied for the first and second site by the ENEC and was allowed in July 2012²⁶⁶. This application process had to be processed by 60 employees of FANR and more than two consulting firms and IAEA²⁶⁷. Those exploiting radioactive material and sources of ionising radiation in the UAE must have a FANR licence; hence, to obtain a FANR licence, users must first apply to FANR - this is to ensure that the highest standards of radiation protection are applied throughout the UAE.²⁶⁸ Possible legal and liability issues are covered in the Federal Law by Decree No. 4 of 2012 Concerning Civil Liability for Nuclear Damage (see Appendix 5). The objectives of the Law include:

- i. To regulate the provisions and determine the scope of the civil liability and compensation for Nuclear Damage.
- ii. To determine the financial security that the Operator must maintain.
- iii. To apply the 1997 Vienna Convention on Civil Liability for Nuclear Damage wherever no provision is made in this Law by Decree.²⁶⁹

While the building of the first nuclear power plant began immediately, the plant will start functioning only in 2017²⁷⁰. Others are expected to start running in subsequent years. The IAEA integrated nuclear infrastructure review mission identified the good practices of the UAE nuclear power programmes as: “co-operation, without compromising their independence, between the regulatory bodies and utility, human resource development, a well-structured management system, and a strong safety culture.”²⁷¹

²⁶⁴Dr. Bryan R. Early, op.cit

²⁶⁵ World Nuclear Association, op.cit.

²⁶⁶ See UAE Government Report 2010.

²⁶⁷Dr. Bryan R. Early, op.cit.

²⁶⁸Federal Authority of Nuclear Regulation (FANR). Licenses & Regulatory Approvals. [Online]. Available at: <http://www.fanr.gov.ae/En/RulesRegulations/Pages/Licences-Guides.aspx> Accessed on 04-09-2013.

²⁶⁹ Article (2) of the Federal Law by Decree No. 4 of 2012 Concerning Civil Liability for Nuclear Damage

²⁷⁰ Ibid. FANR.

²⁷¹ IAEA Staff Report, ‘IAEA Reviews Progress of UAE Nuclear Power Programme’, Available at <http://www.iaea.org/newscenter/news/2011/nppprogramme.html>, Last accessed on 5-08-2012.

The nuclear programme initiated by the UAE aims at disposing the nuclear waste in two ways²⁷². The first method is by a national system of storing and getting rid of the waste allowing for the cooperation of local nations²⁷³. The Middle Eastern countries follow the EU countries' examples for disposing of nuclear wastes²⁷⁴. The UAE collaborates with the USA and South Korea, signing an agreement. Japan has also joined via the signing of a memorandum of understanding with the UAE²⁷⁵. Along with Japan, the UAE also in addition signed an agreement of cooperation with France, who commit support in technology and knowledge transfer necessary for the operation of the nuclear power plant.²⁷⁶

The researcher believes that UAE has carefully considered all risks and opportunities involved with nuclear power production prior to developing the plans to invest in it. The country has studied past nuclear incidents and drawn valuable lessons from their causes and other issues they pose; it can properly strategise for its nuclear power programme. From the above analysis, we can see how the UAE has considered and dealt with risk assessments and is developing coherent risk-management strategies for implementation of its energy proposals.

3.3 Benefits of nuclear energy production

Production of energy on a commercial basis has a greater impact on the economic sphere of a country than on its socio-political aspects. The industrial sector largely depends on power to function and in turn, the economic development of the country is affected by its ability to function efficiently²⁷⁷. Therefore, the decision to use nuclear energy for power production affects the economic development of the UAE. The conventional methods of energy production cannot manage the increasingly demanding needs of the industrial sector²⁷⁸. Thus, alternative methods, like nuclear power generation, are required. The most important reasons for harnessing nuclear power are to curb the dangers posed by

²⁷² See World Nuclear Association, op.cit.

²⁷³ Ibid. World Nuclear Association, op.cit.

²⁷⁴ IAEA Staff Report, op.cit and World Nuclear Association, op.cit.

²⁷⁵ World Nuclear Association, op.cit.

²⁷⁶ See World Nuclear Association, op.cit.

²⁷⁷ Vincent Mulvey, op.cit.

²⁷⁸ Morecroft, John. (2007). Strategic Modelling and Business Dynamics: A Feedback Systems Approach. Chichester, UK: Wiley, 2007

conventional power production on the environment and to satisfy the growing demand for more energy.

Although the solution to fulfilling the need for the huge amount of power is nuclear energy generation, dealing with nuclear waste is a problem affecting the development of the domestic market²⁷⁹ and needs to be addressed. According to Schwartz et al (2008), power production is the sole factor driving the development of a country²⁸⁰. Increased expenditure required for conventional methods of power generation has encouraged sourcing power generated by nuclear energy. The proper use of nuclear energy would help reduce use of non-renewable means of energy production. The expenditure on non-renewable sources like petroleum products diminishes the Gross Domestic Product (GDP) rate of a country²⁸¹.

The UAE is anticipating an increase in the demand for power at the rate of 9 percent per year, which cannot be attained by utilising natural gas for electricity production²⁸². Nuclear energy is used globally and produces 14% of the total electricity production. The production of power through nuclear reactions was first employed in 1954 and this has grown to 450 nuclear power generators producing 2608 billion kWh of power²⁸³. Even though there are more than 100 reactors worldwide to-date, the Middle Eastern and Asian countries have not been successful in making optimum use of nuclear energy. These countries include Iran, UAE, Saudi Arabia, Qatar, Kuwait, Yemen, Israel, Syria and Jordan.²⁸⁴ Over 45 countries are actively considering embarking on nuclear power programmes. These range from sophisticated economies to developing nations. The front runners after Iran are the UAE, Turkey, Vietnam, Belarus, Poland and Jordan.²⁸⁵ The author suggests that states engaging in nuclear energy production can determine the

²⁷⁹ Ibid. Morecroft, John. (2007).

²⁸⁰ Schwartz, Sandi, Masciangioli, Tima, and Boonyaratanakornkit, Boonchai. (2008). *Bioinspired Chemistry for Energy*, Workshop Summary to the Chemical Sciences Roundtable. Washington, D.C.: National Research Council of the National Academies, 3.

²⁸¹ See Morecroft, op.cit.

²⁸² See Christian Blanchard, op.cit.

²⁸³ Wilde, Felix. *Worldwide Development of Nuclear Energy - Strategic Deployment of German Consultancies in the Arabian Market*. (2011). Diplomica Verlag GmbH.

²⁸⁴ World Nuclear Association (2013). *Emerging Nuclear Energy Countries*. [Online]. Available at: <http://www.world-nuclear.org/info/Country-Profiles/Others/Emerging-Nuclear-Energy-Countries/#.Uid68tK1EoA> Accessed on 04-09-2013.

²⁸⁵ Ibid World Nuclear Association (2013).

nature and scope of legal liabilities through state laws, but obviously, these should be in concurrence with, or based upon acceptable international standards.

The UAE has focussed on electricity production utilising nuclear power plants. The safety and misuse of nuclear power is the country's primary concern, as it is the worlds, whilst it embarks upon nuclear power generation. The researcher notes that there have been doubts about abatement of terrorism and destabilising the country's political situation. However, fostering economic and social developments are the UAE's key concerns currently. This has intensified the country's effort to overcome the hurdles of nuclear power production to attain greater economic status. When the world was hit by the devastating economic crisis, the UAE remained optimistic about Abu Dhabi's increasing energy requirements²⁸⁶. This long-term view regarding the increasing demand for energy kept the nuclear power project(s) going, even during the global financial downturn. The country has taken advice from various developed countries such as the UK and the USA. UAE is looking for 'best practice' hence it additionally forms relationships with other international partners. Plus, the ratification of the Non - Proliferation Treaty highlights the good intentions behind UAE's nuclear power generation programme.

It is expected that the number of nuclear power plants intended to be operational in the UAE would bring about the country's much needed economic development. Due to doubts the international community held over Iran possessing weapons of mass destruction, the UAE aims to remain transparent in its own nuclear power activities. The agreement entered into by the UAE and the USA brings clarity to the objectives of nuclear power projects in the UAE and its relations with other nations. The agreement with the USA is expected to elevate the status of the UAE among the GCC for the Arab States.²⁸⁷

The NPT, ratified by the UAE, would help to encourage foreign investment in the country, thereby developing its financial and political status.²⁸⁸ The researcher maintains that it is possible the USA encouraged the nuclear power projects in the UAE to compel Iran to abandon their nuclear projects, thus the impetus for UAE's nuclear programme came from

²⁸⁶ The Report. (2009). Oxford Business Group.

²⁸⁷ Graham, Thomas. "123 Agreement for Nuclear Energy in the UAE: An Unprecedented and Responsible Step," *The Huffington Post*. (2009) Retrieved on 1st January 2012, from http://www.huffingtonpost.com/thomas-graham/123-agreement-for-nuclear_b_210232.html.

²⁸⁸ See Graham Thomas, op.cit.

America's opposition to Iran. According to the US-UAE Business Council of 2009, the increase in the number of nuclear reactors would boost the returns of the UAE government's investments and would in addition facilitate signing of more service and infrastructure contracts to the tune of billions²⁸⁹.

Numerous nuclear power reactors have been built in countries like England, China and Finland encouraging the Middle East and North African countries to also consider utilising nuclear energy.²⁹⁰ Although there has been huge support for the UAE to undertake nuclear power production as the sole source of its electricity supply, there are also various benefits to using solar energy over nuclear power generation.²⁹¹ One of these includes lower capital investment required to set up solar energy, compared to nuclear power generation. There is also no nuclear hazard scenario involved with using solar energy. Regrettably, the use of solar energy alone will not supply the enormous volume of power the Middle Eastern region so desires.

The UAE's traditional methods of energy production simply do not satisfy the growing needs of the country anymore²⁹². Thus, the UAE in considering nuclear power production tries to convince the international community of its intention to use the programme solely for electricity generation and not to produce weapons used for nuclear proliferation and terrorism. This is because the interest the Middle Eastern states have expressed in harnessing nuclear energy is looked upon with suspicion, weighing up Iran's nuclear plans and Israel's alleged possession of deadly weapons which require nuclear energy²⁹³. There is apparently an increasing globally-held notion that terrorism has the backing of Islamic governments. These issues were elaborately considered by the UAE whilst

²⁸⁹ US-UAE Business Council. (2009). *U.S.-U.A.E. Agreement for Peaceful Nuclear Energy Cooperation: Advancing Mutual U.S. and U.A.E Security and Economic Interests*, White Paper. Retrieved on 31 December 2011, from <http://usuaebusiness.org/view/resources/uploaded/White%20Paper%2004-08-09.doc%20%5BCompatibility%20Mode%5D.pdf>.

²⁹⁰ Dennis Kumet, 'The Arab Region as Part of a Nuclear Renaissance: Outlooks and Alternatives', Layla Al-Zubaidi, Joachim Paul, Doreen Khoury(eds.), 'Nuclear energy and the Arab World', Perspectives, Heinrich Boll Stiftung 1 April, 2011.

²⁹¹ Laila Ghanem, 'Women and Nuclear Energy' Layla Al-Zubaidi, Joachim Paul, Doreen Khoury(eds.), 'Nuclear energy and the Arab World', Perspectives, Heinrich Boll Stiftung 1 April, 2011.

²⁹² Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy, released April 20, 2008. Available at: <https://pcs.enec.gov.ae/Content/Home.aspx> Last accessed on 24th August, 2012.

²⁹³ Report on The Integrated Nuclear Infrastructure Review (INIR) Mission to Review the Status of the National Nuclear Infrastructure in The United Arab Emirates, January 2011, Available at <http://www.iaea.org/NuclearPower/Downloads/Infrastructure/files/UAE-INIR-Mission-January-2011-Report.pdf>, Last Accessed on 4-08-2012.

formulating policies to combat these threats. To reassure the UAE does not intend to accumulate nuclear power, the country resorted to sourcing fuel supplies from outside its boundaries²⁹⁴. This gave other countries more confidence vis-à-vis the real objectives of the UAE's nuclear power programme.

Having discussed the economic and political aspects of nuclear power production in the UAE, it is appropriate to now reflect upon the legal issues surrounding the programme. These include the state laws, regulations and statutes that are relevant to this study. These legalities are analysed below.

3.4 Legal issues involved in developing a peaceful nuclear programme

Nuclear power production has the potential to harm the environment. But the carbon footprint set by a nuclear reactor is less than those of the conventional methods of energy production. Apart from producing enormous energy, other issues arise when nuclear power production becomes operational. European nuclear power plants have given optimism to other countries, with the vastly improved performance of the European Pressurised Reactor (EPR) over existing power plants²⁹⁵. The development of laws relating to nuclear power reactors is another reason to opt for nuclear power generation. In addition to these, production from nuclear reactors is more financially viable than other forms of electricity, since nuclear power plants are more durable²⁹⁶.

Before discussing the international requirements for developing nuclear power generation, it is necessary to analyse the requirements of the same in the UAE. Decree No. 6 of 2009 (see Appendix 6) of the UAE deals with the establishment of FANR. The Decree No. 6 came into effect in September, 2009. The FANR is the only regulatory body that deals with the safety, security and protection from nuclear radiation. It has the power to evaluate the conditions for a construction licence²⁹⁷. The licence contains security matters; a report on the environmental impact; pattern of construction; system of

²⁹⁴ See Christopher Blanchard M. et al, op.cit.

²⁹⁵ <http://www.aveva-np.com/scripts/info/publigen/content/templates/show.asp?P=1659&L=US>, Last Accessed August 24, 2012).

²⁹⁶ *The Economics of Nuclear Power*. Information Papers by the World Nuclear Association, p.12. Available at: <http://www.world-nuclear.org/info/inf02.html>, Last (Accessed August 24, 2012).

²⁹⁷ Report on The Integrated Nuclear Infrastructure Review (INIR) Mission to Review the Status of the National Nuclear Infrastructure in The United Arab Emirates, op.cit.

management and the strategy describing the functioning of the plant. When the licence for construction is granted, a licence for operation is applied for²⁹⁸. Only after the issuance of the permit for operation of the plant, can nuclear fuel then be loaded into the plant. The issue of a licence is based on the production and adherence to the safety requirements. The UAE nuclear law offers distinct powers to the FANR to grant licences for the construction and running of nuclear power plants²⁹⁹.

FANR is autonomous and it is mandatory to obtain the permission from the body to carry out nuclear activities in the country³⁰⁰. ENEC is not linked to the FANR. Board members of the FANR have no relation with the country's nuclear activities³⁰¹. Nuclear activities in the UAE are regulated and permitted only by FANR as it is an independent authority of government empowered to do so. Other sources such as radioactive substances and radiation used in medicine, research, oil exploration and other industries are also regulated and permitted by FANR. In addition, it is responsible for controlling and supervising the nuclear sector³⁰² specifically on issues relating to safety and security, radiation protection and safeguards.³⁰³ Every commitment in the relevant international treaties, conventions or agreements ratified by the UAE is conducted by FANR. It also attempts to put together an Emirates labour force to manage the nuclear sector in the country.

Guaranteeing the continuous safety, security and sustainability relating to peaceful application of nuclear energy and ionising radiation in the UAE constitutes the main aim of FANR, through the promulgation of adequate regulations and overseeing their implementation.³⁰⁴ In particular, FANR carries out licensing and assessment activities in line with international best practices, provides strategies for capacity-building for continuity, performs appropriate functions enshrined in the international legal instruments regarding the nuclear sector entered into by the UAE; finally, it ensures administrative

²⁹⁸ Ibid. INIR.

²⁹⁹ See INIR

³⁰⁰ UAE Government Report, op.cit.

³⁰¹ Ibid. UAE Government Report, op.cit.

³⁰² Federal Authority for Nuclear Regulation (FANR) (2012). About FANR [Online]. Available at: <http://fanr.gov.ae/En/AboutFANR/Pages/default.aspx> Accessed on 05-09-2013.

³⁰³ Ibid FANR (2012)

³⁰⁴ See FANR (2012)

principles which maintain quality in regulation³⁰⁵. FANR is accountable to the government of UAE. This is because it is set up by government; therefore, it is important that it presents their activities for scrutiny and approval.

The advantages of nuclear power production have encouraged many countries to harness it. The US President Barrack Obama reiterated in his campaign speech that he wanted to encourage the exploitation of nuclear energy for increased power production³⁰⁶. The UK is striving to achieve greater output of power through nuclear energy too³⁰⁷. The decision to encourage nuclear power production is indeed easier than its implementation. During the operation of nuclear power reactors, practical difficulties may arise which can be attributed to the complexity maintaining standards. The construction of a nuclear plant is a huge task and comes with similar challenges and difficulties in commissioning it. The impediments are the capital funds involved and the investments that are required³⁰⁸.

Unlike other projects and plans in a country, a nuclear power project requires attaining specific international as well as national benchmarks prior to commencement. There are various requirements for obtaining licences, defined in international treaties, which apply to the builders, designers and operators. The mere fact nuclear energy which has a high potential risk to the environment and lives is involved, makes passing security measures mandatory³⁰⁹. The writer understands that there are substantial high risks, which therefore suggest the need for a strong risk assessment and management strategy.

There are international laws or conventions which oversee the use of nuclear energy. The liabilities and duties from an international treaty are confined to the operator. According to Article 9 of the Convention on Nuclear Safety³¹⁰: “[Each] Contracting Party shall

³⁰⁵Federal Authority for Nuclear Regulation (FANR) (2012). Our Vision, Mission & Core Values. [Online]. Available at: <http://fanr.gov.ae/En/AboutFANR/Pages/Our-Vision-Mission-Core-Values.aspx> Accessed on 05-09-2013.

³⁰⁶ Available at: www.iht.com/articles/2008/10/10/america/10nuclear.php Last Accessed August 24, (2012).

³⁰⁷Hansard; Available at: www.publications.parliament.uk/pa/cm200708/cmhansrd/cm081016/debtext/81016-0009.htm, Last Accessed August 24, 2012.

³⁰⁸ The Economics of Nuclear Power. Available at: <http://www.world-nuclear.org/info/inf02.html> Last accessed on August 24, 2012.

³⁰⁹Reece, R., Garancher, T. and Cousin, A. (2009). ‘Nuclear Projects in the 21st Century’, IBLJ 437.

³¹⁰The Convention on Nuclear Safety was adopted in Vienna on 17 June 1994. The Convention was drawn up during a series of expert level meetings from 1992 to 1994 and was the result of considerable work by Governments, national nuclear safety authorities and the Agency’s Secretariat. Its aim is to legally commit

ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such operator meets its responsibility.”³¹¹

The UAE has ratified this convention. This provision is also captured in the UAE Law No 4 of 2012. The country also made its 1st National Report on measures taken by the UAE to implement the Convention on Nuclear Safety in AUGUST 2010. This report was prepared in fulfilment of Article 5 of the Convention for review at the 5th review meeting held in April 2011.

A licence is defined as: “Any authorisation granted by the regulatory body to the applicant to have the responsibility for the siting, design, construction, commissioning, operation or decommissioning of a nuclear installation”.³¹²

The UAE invokes the above definition under the powers provided in Articles (6) and (28) of Federal Law by Decree No. 6 of 2009 Concerning the Peaceful Uses of Nuclear Energy (the Law), the Federal Authority for Nuclear Regulation (FANR) (the Authority) hereby issues a licence to: The Emirates Nuclear Energy Corporation (ENEC) being a corporation established by Abu Dhabi Law No 21 of 2009. This license authorises ENEC to conduct some regulated activity as set forth in Article (25) 1 of the Law.

The Joint Convention on the Safety of Spent Fuel Management also stipulates that the operator is responsible for the functioning of the reactor³¹³. This identifies the nature of the legal liabilities. According to the UAE strategic plan the license holder or the operator of nuclear facility(ies), is liable to any form of disaster taking place during the operation of such facility(ies). This constitutes the purpose of this study - the determination of issues of liability and possible measures to be taken should it occur.

participating States operating land-based nuclear power plants to maintain a high level of safety by setting international benchmarks to which States would subscribe.

See: International Atomic Energy Agency, (2016). Nuclear Safety & Security. [Online]. Available at: <http://www-ns.iaea.org/conventions/nuclear-safety.asp> Accessed on 18/08/2016.

³¹¹Article 9 of the Convention on Nuclear Safety.

³¹²Article 2 of the Convention on Nuclear Safety.

³¹³Article 21 of the Joint Convention on the Safety of Spent Fuel Management.

During a nuclear disaster, the liability of the operator and the investor can be differentiated by the provisions of the international conventions on civil liability. The Organisation for Economic Co-operation and Development (OECD) countries ratified the 1960 Convention on Third Party Liability in the Field of Nuclear Energy, which is also known as the Paris Convention (see Appendix 9).³¹⁴ Later, the Convention on Civil Liability for Nuclear Damage was concluded in Vienna in 1963 (see Appendix 8 - Vienna Convention) taking guidance from the IAEA. This is to say that perhaps, all areas of concern in nuclear power generation have been addressed by the law at the international level. It is therefore imperative that UAE national laws on nuclear energy are aligned with international laws whilst also addressing local issues.

The main objective of the international conventions relating to nuclear energy was to protect the victims of nuclear accident(s) and to promote the implementation of nuclear energy for peaceful purposes. The conventions are aimed both at providing for damages to the victims of nuclear accidents by enforcing liability specifically to one party and development of nuclear projects is not slowed, by unnecessary obstacles, instead that the appropriate laws enable expansion of nuclear industry.³¹⁵ The preamble of the Convention on Third Party Liability in the Field of Nuclear Energy states that: "...desirous ensuring adequate and equitable compensation for persons who suffer damage caused by nuclear incidents whilst taking the necessary steps to ensure that the development of the production and uses of nuclear energy for peaceful purposes is not thereby hindered."³¹⁶

The UAE is committed to ensuring that victims of potential accident(s) arising from its nuclear power programme are adequately compensated. The country complies with relevant legalities regarding claims and compensations. Equally, the country enacts UAE Law by Decree No 4 of 2012, in consideration of the above statement of commitment.

Even though the chances of occurrence of nuclear accidents are very slight the effect of such accidents would be wide-reaching, even disastrous. International Conventions on Nuclear Energy seek to restrict the amount of damages payable by the operator. Such restrictions on the amount of damages would help encourage more investment in the field

³¹⁴ Ibid. Reece R et al, op.cit.

³¹⁵ See Reece R, et al, op.cit.

³¹⁶ See The 1960 Paris Convention.

and increase the number of nuclear reactors for power generation. This is evidenced in countries like UK and USA. The researcher believes that this is a good lesson for the UAE.

Another important aspect of the international conventions relating to nuclear energy plants is that the operator of a nuclear power reactor is the only person responsible for any mishap that takes place from the reactor for which he holds the licence³¹⁷. The international treaties have exemption provisions that restrict the exclusive liability of operators of nuclear power reactors. These exceptions are those damages caused by armed conflicts, aggression, war or rebellion. These exemptions do not include terrorist activities. The exclusive liability clause in the international conventions which binds only the operator of a nuclear reactor, saves the persons providing the operator with nuclear resources, services and the necessary techniques from the responsibilities of providing for any victims³¹⁸. The author observes that the UAE should consult relevant international and national laws to be able to manage this should it happen.

The international conventions do not mention the liability of the suppliers of services and resources if a nuclear accident is caused because of negligence on their part. International instruments remain silent regarding whether the operator can turn to these suppliers in case the accident takes place due to an act or event instigated by suppliers of resources and services. So, that legal obligations on these issues can be determined and evidenced in domestic law, it is possible that countries like the UAE seeking to develop nuclear power, can make laws on such issues. The operator has no responsibility to provide for claims for the damage caused to the tools and amenities of the suppliers of resources and manpower³¹⁹. The UAE can consider dealing with this from the perspective of its national laws. For this reason, this is one of the research objectives.

The operator of a nuclear reactor has the duty to insure the reactor to the extent to which he will be economically liable to the victims should a nuclear accident take place³²⁰. This in turn assures the stakeholders that their claims are protected through insurance.

³¹⁷ See Reece. R et al, op.cit.

³¹⁸ Julia A. Schwartz (2006). *International law and Civil Nuclear Liability after Chernobyl* (OECD, 2006), published at: www.nea.fr/html/law/chernobyl, Last Accessed on June 9, 2012).

³¹⁹ Ibid. Julia A. Schwartz, op.cit.

³²⁰ See Reece R. et al, op.cit.

According to international legal instruments (the 1997 Joint Protocol), the proper forum for adjudication of nuclear accident claims is the courts of the State in which the disaster has occurred. Article (12) (1) states that The Federal Courts in the Emirate of Abu Dhabi shall have exclusive jurisdiction over actions arising pursuant to this Law by Decree.³²¹ It makes the process of claiming damages much easier and uncomplicated. This also allows the maintenance of only one forum for the adjudication of claims. This will guarantee equivalent management of nuclear accident victims³²².

The Chernobyl nuclear disaster in Ukraine warned the member States of Vienna and Paris Conventions (see Appendices 8 and 9) to enact laws which befitted international obligations. These instruments were the Joint Protocol (see Appendix 10), which targeted establishing a relationship between the Vienna Convention and the Paris Convention. The member States also had the objective to overhaul the Convention concluded in Vienna, enact a protocol that made changes to the Vienna Convention and provide for additional damages. There were other protocols which amended the provisions of the Conventions in Paris and Brussels.

The signing of additional protocols to effect amendments in the Paris, Brussels and Vienna Conventions were aimed at widening the scope of liability, to include the right of damages to victims of the nuclear accidents from those nations which are not parties to the Convention on nuclear energy³²³. The UAE has ratified the additional protocols.

The additional protocols have not been enforced and the Conventions on Nuclear Energy only have a few states that have ratified them. Moreover, some of the strongest nations using nuclear energy have not adopted either the Paris or Vienna Conventions. These include Canada, China, South Korea and USA. Interestingly, UAE relies on most of these nations for building its nuclear power plants.

³²¹ The UAE Law by Decree No 4 of 2012.

³²² Ibid. Reece R. et al, op.cit.

³²³ P. Reyners, "Modernisation du régime de responsabilité civile pour les dommages nucléaires: révision de la Convention de Vienne et nouvelle Convention sur la réparation complémentaire des dommages nucléaires," ("Modernising the regime for tortious liability for nuclear damage: revision of the Vienna Convention and new Convention on supplementary compensation of nuclear damage") RGDIP 1998-3, p.747; C. Jarlier-Clément, "Les évolutions récentes des régimes internationaux de responsabilité civile nucléaire" ("Recent Evolution in international nuclear civil liability"), CJEG n° 588, June 2002, p.357; M-B. Lahorgue, "Vingt ans après Tchernobyl: un nouveau régime international de responsabilité civile nucléaire" ("20 years after Chernobyl: A new international regime of civil nuclear liability"), Journal de Droit International, January - February-March 2007, p.103.

Considering the nature of nuclear energy production, it is necessary that member states observe all international conventions regarding nuclear power production. It is not acceptable that while some member states comply with all conventions and other legalities, others do not and this is certainly not in the interest of global peace and uniformity.

3.5 Issues in construction and operation of nuclear power plants: financing, legalities and liabilities considerations

There are several issues involved in the running of a nuclear reactor. It begins with the construction of a nuclear plant which unlike the conventional power plants, lack the factor of certainty and assurance regarding the project's safety. The certainty is affected by massive construction costs, while the concern for uncertainties are in the legal framework and the absence of experience in the operation of nuclear power plants.

Additionally, the strict liability of the operator in case of an accident affects the building of nuclear power reactors, making it more time consuming and problematic in comparison to conventional power generators. Other concerns are the supply of resources to produce electricity and the disposal of nuclear wastes. There are also issues caused by the limited ability to transfer the licence to operate nuclear reactor(s). These factors are obstacles to the construction of nuclear power plants.

The concerns deliberated above can be overcome by effecting some alternatives to the construction of nuclear power plant(s). The States are left with the option to invest and operate the nuclear power plants by awarding construction contracts. There are other innovative methods of construction which demonstrate the participation of both government and private sectors. Such innovative methods are apparent in Europe³²⁴.

³²⁴ *Financing of New Nuclear Power Plants*, (IAEA Nuclear Energy Series, No. NG-T-4.2, September 2008), p.6: available at: http://www.pub.iaea.org/MTCD/publications/PDF/Pub1345_web.pdf last Accessed on June 9, 2012) and also Dominique Finonnet Fabien Roques, Contractual and financing arrangements for nuclear investment in liberalized markets: which efficient combination? *Journal of Competition and Regulation in Network industries*, Vol.9, No.3, September, pp.147 - 181.

The consumer co-operative models have the companies running the nuclear power plants to supply electricity to industries which predominantly use electricity or those that are private power utilities. The consumer co-operative model works with a company that contributes equity and the acceptors of the equity will lend the money to the company which floats the equity. The group responsible for constructing and running the nuclear power plant and the company which floats equity enter an agreement to purchase power, while the company floating equity agrees to sell said power to its shareholders³²⁵. The researcher therefore suggests joint-liability in this instance. The operator of the nuclear power plant contracts with an independent party to construct the plant. Thus, the construction, operation and funding of a nuclear power plant is done through various parties at different stages³²⁶. The researcher suggests that the operator still bears the liability, except when such terms of contracts are documented in form of the law.

The company which finances a nuclear power reactor does not intend to purchase the electricity produced by such a plant. It makes available the funds required by the operator, in return, acquiring the right to buy electricity from any plant run by said operator.³²⁷ The entities providing financial assistance for the building and functioning of the plant are not in direct contact with the construction or operation of that plant. From the perspective of the financing entities, the success of the nuclear power plant is not directly linked to the return of the money invested. Moreover, the investors are not tied up with the liabilities of the operator of the nuclear power plant³²⁸. Again, this is where the law comes to play on the issue of liability in case(s) of harm; but only if it is provided for in the law.

In the traditional model of power plants, the construction contracts are given to another party by the operator for a fixed amount of money. This enables the operator of the power plant to revert to the contractor in the event of any construction or design defects. But this arrangement is not practical in the case of a nuclear power plant³²⁹. A nuclear power plant has two different parts, which are usually constructed by two different companies. So, the two companies are engaged in completely different tasks and may not be interested in

³²⁵ Reece R. et al, op.cit, p.444.

³²⁶ Ibid. Reece R. et al, op.cit.

³²⁷ See Reece R. et al, op.cit, p.445.

³²⁸ Ibid. Reece R. et al, op.cit.

³²⁹ See Reece R. et al, op.cit, p.446.

shouldering the burden jointly³³⁰. This would mean that the operator himself must bear the risks for both companies since he is the beneficiary. The terms of the construction contract are also different from the traditional power plant construction model. The researcher stresses that that contract can clearly indicate the potential liabilities upon parties, if such is provided for in the law.

Another significant difference between conventional power reactors and nuclear power reactors is that the risks of nuclear accidents are the operator's responsibility, which is not the case for operators of conventional power reactors. Allocation of such risks on the owner is covered by the Paris and Vienna Conventions. In a situation, whereby an accident occurs due to a fault in construction, the contractor of a conventional model power plant is liable, but in a nuclear power plant, since the working of the power plant is different, with two distinct parts constructed by different companies, allocation of joint risks to those companies is not possible.

According to the Vienna Convention, "Nuclear damage" is defined as: "loss of life, personal injury, damage to property, and consequential cost and loss to the extent that the loss or damage arises out of or results from ionising radiation emitted by any source of radiation inside a nuclear installation, or emitted from nuclear fuel or radioactive products or waste in, or of nuclear substances coming from, originating in, or sent to, a nuclear installation, whether so arising from the radioactive properties of such matter, or from a combination of radioactive properties with toxic, explosive or other hazardous properties of such matter"³³¹.

Clearly, the above definition encompasses a great deal, even huge, area for risk. The question might be asked: why would any contracting party undertake such risks? The author's view is that this illustrates the nature of nuclear business, thus the expectation is that any party wanting to venture into it must abide by the laws guiding it. Hence, even if leakage from a nuclear reactor is due to possible defect in its construction, the victim of a nuclear accident cannot make the contractor liable for the damage. The construction of nuclear power plants must follow the rules and laws of insurance and indemnification by

³³⁰ Ibid, Reece R. et al, op.cit, p.447.

³³¹ International Conventions on Civil Liability for Nuclear Damage. Series No. 4, at 6, (1976).

the state. This therefore demonstrates that there is no nexus between the damaged third party and the contractor as could be reflected in the common law of tort.

The legal provision which makes the operator of a nuclear power plant liable for nuclear damages is with a view to safeguarding construction contractors (who may cause latent harm due to design defect) against huge liabilities in the event of a nuclear accident. The operator's right to recover the amount of damages paid to victims depends upon national legislations³³². The whole concept of strict legal enforcement of operator responsibility is to exempt the contractor from liability should there be a nuclear disaster. There are differing views regarding this approach, but before the 1980s, this was the practice and it continues³³³. To avoid this, it is therefore necessary to consider a strict liability system as opposed to a fault-based system. This encompasses issues ranging from adherence to operational licences, jurisdiction, enforcements and prosecution.

Traditionally, the control of conventional power plants remains with the contractor until the operator is satisfied with the construction. Comparatively, in a nuclear power plant, control rests with the operator immediately after installation of the nuclear reactor(s)³³⁴. The procedures from this point onwards for testing the plant is in good working order can only be carried out by the operator, not the contractor, unlike in traditional power plants. As soon as the nuclear resource is fed into the reactor, the control of the plant rests only with the owner of the plant. In a conventional power plant, if the functioning of the plant does not satisfy the operator, it can be rejected. This is not the case in a nuclear power plant. The rejection or return of the nuclear plant to the contractor is not possible according to the existing international laws, since holding a plant which is inoperable, but which has nuclear reactive fuel in it would not be appropriate³³⁵.

In the construction of power plants employing conventional methods, disruption of work due to unexpected circumstances entitles the contractor to extend completion deadline. However, regarding nuclear power plants, there are certain differences: the laws on nuclear energy and production of electricity in many countries are in their early stage and

³³²Reece R. et al, op.cit. p. 449.

³³³ Julia A.Schwartz, op.cit, p.59.

³³⁴ Reece R. et al, op.cit. p.449.

³³⁵ See Reece R. et al, op.cit, p.450.

the precedents in this field are fewer, compared to the electricity production by conventional methods. Due to the lack of experience in the field, the procedures for getting the licences and other approvals are protracted. Other than lack of experience, the requirements for fool-proof construction and operation of the nuclear power plant, vis-à-vis the high level of safety and security involved, contribute to delays in getting the necessary approvals and licences.

3.6 Possible expectations from the international community

Most of the specialised representatives of the United Nations (UN) concern themselves with social and financial matters affairs. The IAEA's objective however, is more specific: investigate and tackle recent technology that can bring about massive destruction to mankind³³⁶. The security and safety of nuclear power projects has always been a matter of concern for the countries embarking on such projects³³⁷. It is not only those countries dealing with nuclear energy that are worried about its hazards, but also those that share boundaries with them³³⁸.

In 2009, the UAE ratified the IAEA treaty that deals with Nuclear Safety. It also ratified the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management³³⁹. The country also accepted the Federal Law that deals with the Peaceful Use of Nuclear Energy (see Appendix 6) providing for a scheme for licensing and controlling the use of nuclear materials³⁴⁰. It provides for the supervision of the FANR to regulate nuclear energy activities in the country too³⁴¹. Additionally, FANR assigns a Regulator's board under the leadership of a regulator with long standing, from the USA.³⁴² The development, construction or operation of uranium resources or facilities for the processing of spent fuel within UAE is made an unlawful act³⁴³.

³³⁶ Fischer David, op.cit.

³³⁷ Ibid. Fischer David, op.cit.

³³⁸ H.E. Ambassador Hamad Alkaabi, op.cit.

³³⁹ Ibid. H.E. Ambassador Hamad Alkaabi, op.cit.

³⁴⁰ See Fischer David, op.cit.

³⁴¹ Ibid. Fischer David, op.cit.

³⁴² See Fischer David, op.cit.

³⁴³ World Nuclear Association, op.cit.

The financing strategies in the nuclear industry are formed by ENEC, coupled with an extra duty to supervise the growth of the nuclear programme in the UAE³⁴⁴. It deals with financing the nuclear sector within the boundaries of the UAE as well as outside the country³⁴⁵. Generally, ENEC is empowered to ensure that the country's nuclear programme is successful.

The Nuclear Safety Review Board analyses the security and impact of building the nuclear power plant as well as initiating the ENEC programme. The Board also helps in re-evaluating the licenses granted for building power plants³⁴⁶. The Board has members from the USA, Japan and Korea. Members are experts in the field of nuclear power production. An International Advisory Board was established by the ENEC too³⁴⁷.

The World Association of Nuclear Operators is a union of countries that deal with nuclear power generation. Its objectives: to provide a friendly atmosphere for countries to cooperate and offer suggestions aimed at avoiding nuclear disasters³⁴⁸. The UAE would greatly benefit from the World Association of Nuclear Operators³⁴⁹ and can make necessary reforms to guarantee a high level of security and safety.

For the last twenty years, there have been various concerns arising from the Treaty on the Non-Proliferation of Nuclear Weapons³⁵⁰. In 1996, the Non-Proliferation Treaty (see Appendix 13) was ratified by the UAE promising not to misuse nuclear energy³⁵¹. The country demonstrates its concerns apropos the dangers of nuclear energy being put to unnecessary and deadly use³⁵² and is strongly against the practice, whilst remaining transparent in its pursuit for nuclear power. The UAE governments' policy is to practically display its support of the removal of weapons for mass destruction from the Middle East³⁵³.

³⁴⁴ Ibid. World Nuclear Association, op.cit.

³⁴⁵ UAE Government Report op.cit.

³⁴⁶ Ibid. Government Report op.cit.

³⁴⁷ Ibid. Government Report op.cit.

³⁴⁸ US-UAE Business Council, op.cit.

³⁴⁹ Ibid. US-UAE Business Council, op.cit.

³⁵⁰ The Embassy of the United Arab Emirates in Washington DC, Available at: <http://www.uae-embassy.org/uae/foreign-policy/non-proliferation> , last accessed on 7-8-2012.

³⁵¹ The Embassy of the United Arab Emirates in Washington DC, op.cit.

³⁵² Ibid. The Embassy of the United Arab Emirates in Washington DC, op.cit.

³⁵³ See: The Embassy of the United Arab Emirates in Washington DC, op.cit.

The UAE's real intention in having its nuclear plan is evident in its membership of the IAEA and the NPT. This should reassure the world the country does not intend to misuse its nuclear energy. The country is also a member of the Global Initiative to Combat Nuclear Terrorism. Therefore, the UAE obviously advocates global protection from nuclear threats. UAE, being a signatory to the NPT has showed its dissatisfaction over the accumulation of nuclear power by Iran, suspected to be developing mass destruction weaponry³⁵⁴. The country also supports the resolution passed by the UN, banning the transportation of materials with nuclear potential and technology to Iran³⁵⁵.

The Mega Ports Initiative is supported by the UAE, instigated to avert the transportation of nuclear materials by terrorists through water³⁵⁶. The country has also ratified the Proliferation Security Initiative aimed at preventing the carriage of weapons of mass obliteration, including materials that can be used for such a purpose. The United States Container Security Initiative is likewise supported by the USA. The initiative enhances the security of the port in Dubai, by keeping close watch on cargo being transported to the USA³⁵⁷. The researcher suggests that the Mega Port Initiative, if fully implemented by the UAE, is capable of reducing the country's nuclear programme's potential liabilities.

The Dubai Ports World is a member of the Secure Freight Initiative, which controls cargos transported to the USA and UK, protecting them from the dangers of radiation. The Customs-Trade Partnership against Terrorism considers Dubai Ports World as its associate in ensuring the safety of the commercial cargos belonging to government. The carriage of radioactive materials between boundaries is being closely monitored with the help of the United States Department of State (USDS)³⁵⁸.

Additionally, the UAE has adopted strategic and operational policies for the successful formation of its nuclear power programme. The country strives to attain transparency in

³⁵⁴ CRS Report RL33865, Arms Control and Non-proliferation: A *Catalogue of Treaties and Agreements*, by Amy F. Woolf, Mary Beth Nikitin, and Paul K. Kerr. The UAE has had an IAEA safeguards agreement in force since 2003. The text is available at <http://www.iaea.org/Publications/Documents/Infcircs/2003/infcirc622.pdf>

³⁵⁵ Ibid. CRS Report RL33865.

³⁵⁶ Vincent Mulvey, op.cit, and see The Embassy of the United Arab Emirates in Washington DC, op.cit.

³⁵⁷ CRS Report RL33865, op.cit.

³⁵⁸ Ibid. CRS Report RL33865, op.cit.

the functioning of its nuclear agenda and is following the primary methods of non-proliferation of nuclear materials³⁵⁹. Plus, it strives to maintain standards towards maintaining the safety and security of the nuclear power programme³⁶⁰. Furthermore, it has shown commitment to cooperating with the IAEA in formulating a nuclear programme which will satisfy desires for peace held by its own people and those of the international community³⁶¹. The country promises to work with others towards devising more nuclear programmes for peaceful usage. Finally, it also strives to encourage the sustainability of peaceful nuclear programmes³⁶² while restricting the use of nuclear power for exportation of nuclear products to curb the dangers of nuclear proliferation.

Formed to uphold nuclear non-proliferation, the Nuclear Threat Initiative (NTI) is supported by the UAE. For this reason, the country pledged ten million dollars to show solidarity towards the fuel bank initiative of the IAEA. This amount is to be used for reinforcing the non-proliferation plans³⁶³.

In general, the UAE has signed many instruments for preventing the misuse of nuclear energy. These include: the IAEA Treaty on Non-Proliferation of Nuclear Weapons in 1996; IAEA Comprehensive Safeguards Agreement in 2003; IAEA Convention on the Physical Protection of Nuclear Material in 2003; UN Comprehensive Test Ban Treaty in 2000; UN Security Council Resolution of 1540 in 2004; and the UN International Convention for the Suppression of Acts of Nuclear Terrorism in 2005 (see Appendix 7)³⁶⁴. The country plans to approve the IAEA Additional Protocol to Safeguards Agreement; the IAEA Amendment to the Convention on the Physical Protection; and the Nuclear Suppliers Groups Export Guidelines³⁶⁵. The UAE has gained more experience from these instruments and is developing its national mechanisms to facilitate their needs and implementation³⁶⁶. The main aim of these ratifications is to ensure that the country operates its nuclear programme according to acceptable standards.

³⁵⁹ CRS Report RL33865, op.cit.

³⁶⁰ Ibid. CRS Report RL33865, op.cit.

³⁶¹ The Embassy of the United Arab Emirates in Washington DC, op.cit.

³⁶² Ibid. The Embassy of the United Arab Emirates in Washington DC, op.cit.

³⁶³ See: The Embassy of the United Arab Emirates in Washington DC, op.cit.

³⁶⁴ Ibid. The Embassy of the United Arab Emirates in Washington DC, op.cit.

³⁶⁵ CRS Report RL33865, op.cit.

³⁶⁶ Ibid. CRS Report RL33865, op.cit.

The country has also ratified various safety instruments. These are the IAEA Convention on Early Notification of Nuclear Accident (see Appendix 14) and the IAEA Convention on Assistance in the case of a Nuclear Accident or Radiological Emergency³⁶⁷. The UAE plans to sign the IAEA Treaty on Nuclear Safety and the Safety of Spent Fuel Management in the future³⁶⁸.

On completion of the nuclear power plants, UAE will be accountable under the IAEA 1963 Vienna Convention on Civil Liability for Nuclear Damage (see Appendix 8); IAEA Protocol to Amend the Vienna Convention on Civil Liability (see Appendix 10); IAEA Joint Protocol on the Application of the Vienna and Paris Conventions (see Appendix 12); and the IAEA Convention on Supplementary Compensation for Nuclear Damage (see Appendix 11)³⁶⁹.

The reprocessing and enrichment of nuclear raw materials can be useful in certain nuclear reactors, but at the same time can be employed for the manufacture of mass destructive weaponry. This dual usage can be perceived as suspicious, due to the fear of envisaged possible harm. To assuage suspicion, the ratification of the NPT by UAE assures its nuclear activities would be bound by IAEA regulations³⁷⁰. The Additional Protocol would increase the accessibility of the UAE's nuclear activities. UAE plans to depend on light-water reactors instead of heavy-water ones, which can effectively reduce the misuse of nuclear reactive materials. Noteworthy also is that in fact, nuclear weapons are not normally manufactured by nuclear reactors which are producing energy on a commercial basis³⁷¹. The ratification of the NPT (see Appendix 13) subjected the UAE to the regulations of the IAEA; thus, all nuclear activities in the country must comply with international regulations.

3.7 Summary of Chapter Three

The use of nuclear energy by countries is often suspected by the international community acknowledging it can also signify production of deadly weapons which would affect the

³⁶⁷ Christian Blanchard, op.cit and see The Embassy of the United Arab Emirates in Washington DC, op.cit.

³⁶⁸ The Embassy of the United Arab Emirates in Washington DC, op.cit.

³⁶⁹ Ibid. The Embassy of the United Arab Emirates in Washington DC, op.cit.

³⁷⁰ CRS Report RL33865, op.cit.

³⁷¹ International Institute for Strategic Studies, Nuclear Programmes in the Middle East: In the Shadow of Iran, May 2008.

present and future generations. In view of this, the use of nuclear energy requires strict planning and implementation.

From the discussion, it could be seen that the UAE's power usage rises at the rate of almost 10 percent annually. The conventional methods of electricity production have been using water, natural gas or oil. Though the UAE is rich in petroleum resources, constant use would mean continuous depletion of the resources, which cannot be replenished. Not only does the depletion of these resources matter, the truth is that they cannot provide for the ever-increasing power requirements of this economically developing nation.

Therefore, UAE considers a method of generating power without cost to the non-renewable petroleum resources. Coal was the next option for the country, but although it was found production of electricity from coal was economically viable, the danger of its combustion in the environment is well-known. Therefore, the only option left which is cheaper, as well as capable of producing commercial quantities of power was nuclear energy. Hence, the UAE decided to opt for nuclear energy to produce power in the country.

The nuclear power projects in the country are intended to be used for peaceful purposes only. The country is therefore very cautious in handling these projects and would not want to jeopardise the integrity of the country. This reassured the neighbouring countries that the projects were exclusively intended to produce power. The country's plan is to build about fourteen nuclear power plants across its cities, with four billed to be operational by the year 2020. The country started the construction of the power plant in Abu Dhabi in collaboration with a Korean Consortium, selected after a bid from nine other companies.

The plants will create many jobs; thus, many UAE nationals are being trained to take up these jobs as incorporated into the contractual obligations of the Korean Consortium. Most employees in the UAE are foreigners. Working in the nuclear power plant is risky, hence it requires a large amount of practical experience to avoid possible disasters. Of note is that the difference in cultural practices also affects the imparting of knowledge from Korean counterparts. Although time consuming, the GNEII was set up to train the UAE nationals to exclusively construct and run the nuclear power plants.

The expectation is that the power projects will benefit the country economically; this development will increase the GDP of the country. To maintain transparency in the running of the nuclear programme, ENEC was formed as a public entity. The corporation is to evaluate and control the running of the nuclear power programme.

To maintain transparency in the nuclear programme, the country is against the enrichment of nuclear fuel, since it will create ambiguity regarding the nuclear power production programme. This is because fuel enrichment also occurs when producing nuclear weapons. The UAE adheres strictly to the rules and regulations of the national and international agencies policing the safe handling of nuclear energy. The leadership of the country is updated on issues regarding the nuclear programme by the International Advisory Board (IAB). The Board is a pool of highly skilled professionals from around the world for assuring the safety of the programme as well as adhering to its primary purpose.

In addition to the domestic agencies that ensure the safeguards, there are also international agencies to control the affairs of the nuclear power programmes. The World Association for Nuclear Operators (WANO) are a union of countries that use nuclear energy for power production. These countries help each other and give recommendations for safer handling of the nuclear energy. The UAE is a member of various organisations which include primarily the IAEA. The ratification of the IAEA's NPT by the UAE is a welcome development.

The UAE, despite the financial crunch have taken the risk to continue with the programme since expectation is that the demand for electricity will not fall. Records from the authorities show that the demand for electricity would rise at a very high rate, hence the need for nuclear power. Perhaps, the country acknowledges that it is going to gain economically from the project

Having looked at the motivational framework for the UAE to possess nuclear energy as well as the concerns that the country might face in running the programme, it is important to consider the management and monitoring of potential liabilities should it successfully acquire Nuclear power. These are analysed in the next chapter.

CHAPTER FOUR

MANAGING AND MONITORING OF POTENTIAL LIABILITIES SHOULD UAE HAVE NUCLEAR ENERGY

4.1 Introduction to Chapter Four

Chapter Four discusses the evaluation of the management and monitoring of potential liabilities for the UAE nuclear programme. Other issues analysed are likely legal liabilities, nuclear liability principles and international frameworks for nuclear liabilities. The chapter further analyses how other countries, especially the developed nations (for examples: USA, UK and Japan), have managed liabilities from their nuclear power programmes. The chapter then examines possible lessons the UAE could learn from previous nuclear incidents, as examples: the 1957 Windscale disaster; the 1979 Three Mile Island; the 1986 Chernobyl accident; and the 2011 Fukushima accident. Reviews of the nature of criminal and civil liabilities of nuclear energy are also conducted. The overall aim of this chapter is to address the issues regarding liability coverage in the event of nuclear accident, should the UAE possess nuclear energy. The points raised in this chapter are inter-linked, in that they specifically present substantial lessons the UAE could benefit from, to deal with liabilities originating from its nuclear power project/plans.

4.2 Managing and monitoring of potential liabilities should UAE have Nuclear Energy

During the last century, more than a hundred countries have relied on nuclear power plants to produce energy to meet their increasing need for electricity. Even though many of them have shown interest in nuclear power generation, the way they have implemented their nuclear energy programmes have been different³⁷². These dissimilarities are due to the uncertainties arising from concerns about nuclear accidents, such as those at

³⁷²Fuhrmann, Matthew, (2009). ‘Spreading Temptation: Proliferation and Peaceful Nuclear Cooperation Agreements’. *International Security* 34(1):7-41; and Miller, Steven and Scott Sagan. Nuclear Power without Nuclear Proliferation? *Daedalus* 138(4):7-18.

Chernobyl and Fukushima Daiichi in Japan. These accidents have created doubts about the approach of industrialisation used. The then German Chancellor, Angela Merkel pronounced that the Fukushima Daiichi incident could result in a change in the global system of commercialisation³⁷³. In addition to nuclear accidents which can affect many countries, there are other risks associated with the use of nuclear active products capable of producing the raw materials for nuclear weapons. Such practices could possibly cause insecurity at the international level.³⁷⁴

There are various reasons why more countries opt for nuclear power generation. The cost-effectiveness of nuclear power plants is one of the reasons for such widespread attraction.³⁷⁵ Although this method is economical, the capital investment required is much higher than that of other more conventional production methods.

Another reason is the issue of security provided to a country in relation to energy. When a country relies on another for its energy requirements, it will do everything possible to protect its interests and exert influence³⁷⁶. This may result in insecurity. In order to avoid this, many countries opt for nuclear power generation³⁷⁷ within their own territory.

There are opposing reasons for countries deciding on nuclear power plants. These include the drastic effects of radioactive materials, intense investment and difficulty in applying the complex technological skills. Since it is possible the consequences of a nuclear reactor in one country may be felt by another, it is necessary to frame definite rules and regulations regarding the liabilities to be incurred, by parties signing up to such programmes. There are various legal liabilities (including both civil and criminal), to be accepted by the participating parties. This chapter therefore tackles the liabilities of nuclear power projects in four parts.

³⁷³Kitschelt, Herbert, (1986). Political Opportunity Structures and Political Protest: Anti-Nuclear Movements in Four Democracies, *British Journal of Political Science* 16(1):57-85.

³⁷⁴Wohlstetter, Albert, Thomas A. Brown, Gregory Jones, David C. McGarvey, Henry Rowen, Vince Taylor, and Roberta Wohlstetter, (1979). *Swords from Ploughshares: The Military Potential of Civilian Nuclear Energy*. (Chicago: University of Chicago Press)

³⁷⁵Poneman, Daniel, (1982). *Nuclear Power in the Developing World*. (Winchester, MA: Alien and Unwin).

³⁷⁶Matthew Fuhrmann, (2012). Splitting Atoms: Why Do Countries Build Nuclear Power Plants? *2012 International Interactions, Vol. 38:1*, also available at: <http://ssrn.com/abstract=1832504>, Last accessed on 5th June, 2013.

³⁷⁷ Morgenthau, Hans. (1993). *Politics among Nations: The Struggle for Power and Peace* (New York: McGraw-Hill)

The first part of the chapter addresses the possibilities of liabilities that may arise from nuclear power projects including environmental concerns. The second part analyses the methods which States that already have nuclear power plants, have used to deal with possible liabilities. Meanwhile part three analyses the legal concerns arising from the Chernobyl and Fukushima incidents and how the UAE can make changes in operations and legislations. Part four reviews the nature of civil and criminal liabilities that may arise in a nuclear power project. Collectively, the consideration of these points helps to augment the lessons the UAE could learn from each of them to successfully manage potential liabilities from the nuclear power programme.

4. 3 Possible legal liabilities

4.3.1 Operator Liability

This section of the thesis analyses the legal liabilities that should be prepared before venturing into nuclear power projects. There are many limitations to international legal systems. These limitations include: they are suggestions; there is need for consensus; they lack a single international “ruler”; they lack enforcement mechanisms (“world police”); funding is restricted; they possess vast differences in cultures and have no real “norms”.³⁷⁸ The source of international law has been defined differently by different actors. The absence of an authority gives a negative impact to international law and its execution³⁷⁹. The researcher proclaims that this means a central controlling agency, but who can fulfil this role? Is it the IAEA or the UN? The international law requires consensus between states, how is this to be achieved in the sensitive area of nuclear development? It is suggested that there are large political, as well as legal limitations here.

Since the systems of legislature, the judiciary and executive are absent in international law, it is difficult to compare how it complements national laws. International law is entirely different from a national law in terms of drafting, implementation and enforcement. The absence of these three features prevents its efficacy, unlike domestic

³⁷⁸Enotes.com (2015). What are the main limitations of international law? Provide examples. [Online]. Available at: <http://www.enotes.com/homework-help/what-main-limitations-international-law-provide-474806> Accessed on 18/08/2016.

³⁷⁹Richard E. Levy, (1987). International Law and the Chernobyl Accident: Reflections on an Important but Imperfect System, Kansas Law Review Vol.36, pp. 81-131.

laws³⁸⁰. The researcher views that it is better to utilise domestic laws, which are drafted in consonant with relevant international laws.

Due to technological advancements, there is a reduction in the effects of nuclear reactions on the environment. Nuclear power now poses a very suitable competition for the other methods of power generation. Moreover, the laws relating to these projects have been well defined today, with a clear demarcation of the liabilities of each party involved in the projects.³⁸¹ The development of international law and the increasing cost of raw materials required for the conventional methods have attracted the interest of new countries to nuclear power generation³⁸².

Since international conventions have relevant rules for setting up a nuclear power project, it is necessary the UAE ascertains the legal challenges associated with nuclear power projects. According to the Convention on Nuclear Safety, the safety of each nuclear fitting is the responsibility of the person who holds the licence for the same. Therefore, every contracting party should be cautious as to the methods adopted by the operator³⁸³.

The liability of the contracting parties can be ascertained by analysing international legality concerning civil liability. There are two conventions relating to civil liability in the case of a nuclear accident. One is a regional convention meant for European countries, while the other is the International Convention on Civil Liability for Nuclear Damage adopted on May 21, 1963. This was drafted under the supervision of IAEA³⁸⁴. This was drawn up to encourage more investment in this area by securing the interests of the victims if an accident takes place³⁸⁵.

According to the international Convention, victims of nuclear accidents can seek compensation even without proving that the operator of the plant was responsible for such injury/accidents. There is no burden of proof on the victims. The operator of the plant is

³⁸⁰J. Starke, (1984). *Introduction to International Law* (9th Ed, Butterworth & Co Publishers Ltd.) and B. Weston, R. Falk & A. D'Amato, (1980). *International Law and World Order*, pp. 116-146.

³⁸¹ See: Starke J., (1984).

³⁸²*The Economics of Nuclear Power* (Information Papers by the World Nuclear Association, August 2008), p.12, available at: <http://www.worldnuclear.org/info/inf02.html> Last Accessed June 9, 2013.

³⁸³ Article 9 of the Convention on Nuclear Safety.

³⁸⁴Rupert Reece, Thomas Garancher, Antoine Cousin, 'Nuclear Projects in the 21st Century', 2009 I.B.L.J 437.

³⁸⁵Preamble, Paris Convention on Third Party liability in the Field of Nuclear Energy, 1960.

strictly liable for the accident and its consequences³⁸⁶. According to the Paris and the Vienna Conventions, there is no exclusion for the liability so mentioned, other than when such an accident occurs due to an act of State, war or insurrection. Barring when an injury or damage is caused by the victim due to lack of attentiveness, the operator of the reactor, will not be held liable.

Another interesting, notable point here is that suppliers of raw materials, labour or the mode of operation cannot be held liable for the consequences of a nuclear accident. Again, only the operator who holds the licence to operate the reactor will be held liable under the international conventions³⁸⁷. Even though the suppliers or the owners of the nuclear reactor are free of compensating the victims of a nuclear accident, the operator cannot be held liable for the property(ies) belonging to the suppliers or owners, which were used for the running of the nuclear plant and have been damaged by this accident³⁸⁸. However, when cause has to do with the running and/or operation, the operator is deemed at fault.

Although the legal liability of the operator of a nuclear reactor is wide, there are limitations on the amount that can be claimed by victims. Such claims also have a limitation period which becomes applicable after a certain period and the lapse of such time invalidates the claim³⁸⁹. This does not seem to be a ‘good thing’. The researcher argues that based on the nature of radioactive radiation, it is possible it could take a long while for the effects of such radiation to be noticed in order that claims can be made.

The operator is solely responsible for the damages to be paid to the victims of a nuclear accident. This makes it mandatory for an operator to secure finances for such claims through insurance and securities through channelling. The international conventions also stipulate that individuals who suffer a nuclear accident can prefer to place their claims in the country in which the accident took place. Additionally, this reduces time and complexity if such claims were to be decided by an international body. It also guarantees equal rights for all claimants.

³⁸⁶ Nathalie L. J. T. Horbach and P. Blanchard, ‘Responsabilité civile nucléaire des transports internationaux: Questions nouvelles et propositions’, (“Civil nuclear liability in the transport of international materials: New questions and propositions.”) 2006 RDAI, 633 to 662.

³⁸⁷ Julia A. Schwartz, International law and Civil Nuclear Liability after Chernobyl (OECD, 2006), Available at: www.nea.fr/html/law/chernobyl Last Accessed on June 9, 2013).

³⁸⁸ Ibid.

³⁸⁹ Paris Convention, op.cit and the Vienna Convention on Civil Liability for Nuclear Damage, 1997.

Another important and encouraging aspect of nuclear power projects is that the capital required for construction and equipment can be loaned from creditors. These creditors, in the case of other, conventionally fuelled power plants, are given guaranteed security of the plant, which could then be run by them if the loan is not repaid. In the case of a nuclear power plant, however, since the operator alone can operate the project and be responsible for any accident, the creditors' interest will not be properly addressed. The creditors will not be able to take over the plant and so the present legality does not provide for their needs. While lending money for a nuclear power plant, the creditor cannot take the nuclear power plant as security³⁹⁰. Therefore, the question arises: what about investors' protection? It is possible that state legislation can be drafted to provide for investors' protection mostly on occasions whereby the fault is not theirs, but, this should be proven beyond reasonable doubt. The author maintains that it is still possible the investor must take on insurance cover for their investments.

Also, victims of a nuclear accident cannot turn to the contractor or the owner of the project - only the operator - even if the accident is because of the design or construction. The right of the operator to be indemnified for the damage that occurs due to contractor fault has not been defined in the international legal instruments that deal with nuclear power projects. Such liabilities will be decided according to the domestic law in practice³⁹¹. The international instrument providing for a situation where the operator could claim indemnity from the contractor is to encourage nuclear power projects contractors to work without huge insurance policies and other securities³⁹². This could be likened to systems within environmental law, for example, the liabilities attaching to parties responsible for oil spillages at sea.

4.3.2 State Liability

International law makes it obligatory on the part of ratifying states not to operate nuclear power plants in such a way that they cause environmental pollution or destruction that go

³⁹⁰ Rupert Reece et al, op.cit.

³⁹¹ Art.6 of the Paris Convention, and Art.IV of the Vienna Convention, and the different approaches taken by various non-convention States.

³⁹² Cosimo Rucellai, "Contrats de fourniture nucleaire, responsabilité des dommages et arbitrage", 1978Rev. De l'Arbitrage 450

beyond geographical boundaries. According to the customary international law as defined in the Trail Smelter Case, no sovereign state should allow the use of its territory for creating injury in another³⁹³. Based on tacit international customs law, the Declaration approved by the Stockholm Conference on the Human Environment by Principle 21, holds that all sovereign states have the responsibility for ensuring that the activities occurring within its territory should not result in damage to the environment of other states³⁹⁴. Various international legal instruments, like the Declaration on Environment and Development, the 1982 Convention on the Law of the Sea and the Convention on Biological Diversity, reiterate the same principle of liability of nations to prevent environmental pollution and damage³⁹⁵. The author suggests that UAE should consider the provisions of the above Convention and Declaration towards protecting biodiversity and the environment, while developing its nuclear power.

The IAEA has issued regulations and legal status of codes of conduct relating to radioactive waste management. These codes of conducts are guidance/regulatory, and do not of themselves create legal liabilities. Though not ratified by all countries, these recommendations have persuasive value³⁹⁶. The IAEA made the provisions of the Convention on Nuclear Safety mandatory for the states to follow³⁹⁷. These Conventions make it the liability of the State to ensure the safe use of nuclear materials within its jurisdiction³⁹⁸. Furthermore, the Convention on Environmental Impact Assessment also makes it the liability of the state to take “all appropriate and effective measures to prevent reduce and control significant adverse trans-boundary environmental impact from proposed activities”³⁹⁹ individually or collectively.

³⁹³ Trail Smelter (U.S. v. Can.), 3 R. Int’l Arb. Awards 1905 (1938 & 1941)

³⁹⁴ Conference on the Human Environment, Stockholm, Swed., ‘Report of the United Nations Conference on the Human Environment’, Principle 21, U.N. Doc. A/CONF.48/14/REV.1 (Jan. 1, 1973)

³⁹⁵ Conference on Environment and Development, Rio de Janeiro, Braz., June 3-14, 1992, *Report of the United Nations Conference on Environment and Development*, Vol. I, Principle 2, U.N. Doc. A/CONF.151/26/REV.1(VOL.I) (Jan. 1, 1993), United Nations Convention on the Law of the Sea art. 194(2), Dec. 10, 1982, 1833 U.N.T.S. 3 and The Convention on Biological Diversity art. 3, June 5, 1992, 1760 U.N.T.S. 79.

³⁹⁶ David B. Dixon, ‘Transnational Shipments of Nuclear Materials by Sea: Do Current Safeguards Provide Coastal States a Right to Deny Innocent Passage?’, 16 J. TRANSNAT’L L. & POL’Y 73, 84-87 (2006). Convention on Nuclear Safety, June 17, 1994, S. TREATY DOC. NO. 104-6 (1995), 1963 U.N.T.S. 293

³⁹⁷ Ibid. Convention on Nuclear Safety.

³⁹⁸ Ibid. Convention on Nuclear Safety.

³⁹⁹ Article 2(1), Convention on Environmental Impact Assessment in a Transboundary Context app. I(2)-(3), Feb. 25, 1991, 1989 U.N.T.S. 309.

The management of nuclear active wastes is of concern to the international community. While there are prohibitions in place for disposing of such wastes beyond a country's geographical boundary, there are many instances where such wastes are being exported to other countries. The safe and proper management of nuclear wastes has been a matter of discussion among nations. The Joint Convention on the Safety of Spent Fuel Management and Safety of Radioactive Waste Management is obligatory for more than thirty countries and makes these sovereign states liable for the management of nuclear wastes⁴⁰⁰. International conventions thus oblige each country to take domestic measures during law making to provide for the safe treatment of nuclear active materials and wastes arising from power plants.

4.4 Nuclear liability principles

According to the President of IAEA Board of Governors General Conference: International Conference on the Safety of Transport of Radioactive Material: "There remains considerable uncertainty and debate related to the implementation of a comprehensive regime to deal with the legal liability resulting from an accident during the transport of radioactive material".⁴⁰¹ There are many liability-related conventions, to which many states are parties while others are not. The President added that: "the provisions of the liability conventions, and the relationships between them, are not simple to understand"⁴⁰² concluding that: "the preparation of an explanatory text for these instruments would assist in developing a common understanding of what are complex legal issues, and thereby promote adherence to these instruments. The Agency Secretariat should prepare such an explanatory text, with the assistance of an independent group of legal experts appointed by the Director General."⁴⁰³

⁴⁰⁰ Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management pmbl. vi, Sept. 5, 1997, 2153 U.N.T.S. 357.

⁴⁰¹ International Conference on the Safety of Transport of Radioactive Material held in Vienna, Austria, from 7 to 11 July 2003.

⁴⁰² See International Conference on the Safety of Transport of Radioactive Material held in Vienna, Austria, from 7 to 11 July 2003.

⁴⁰³ Boyle, Alan (2005). Globalizing Environmental Liability: The Interplay of National and International Law. *Journal of Environmental Law*, Vol. 17 No. 1, 4. See further, Fitzmaurice, Malgosia: International Responsibility and Liability, in: Bodansky, Daniel - Brunnee, Jutta - Hey, Ellen (eds.): *The Oxford Handbook of International Environmental Law*. Oxford University Press, Oxford - New York, 2007. 1024.

The researcher notes that the adoption of both the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage in 1997 (1997 Protocol) (see Appendix 10) and the Convention on Supplementary Compensation for Nuclear Damage (CSC) (see Appendix 11) demonstrated the most important landmark in the growth of international nuclear liability instruments. The above instruments contain essential progression in the quantity of reparation obtainable, the extent of injury covered and the allotment of control. In addition, the CSC offers the support for creating a comprehensive system with extensive observance by nuclear and non-nuclear countries. The UAE is party to these regimes and have also incorporated their provisions into the domestic nuclear laws.

The following principles are present within the Conventions and the laws regarding the nuclear third party liability. These principles help to shape nuclear regimes. They are the nuclear operator's strict liability; operator of nuclear installation's exclusive liability; provision of compensation without nationality, residence or domicile discrimination; the liability operator's financial coverage to be mandatory; the jurisdiction to be exclusive (especially for the nuclear accident jurisdiction areas and the courts of State) and the time and amount liability limitation.⁴⁰⁴

Situations may arise whereby **Strict Liability** is maintained. This means that the victim of nuclear incident does not have to prove fault. The claimant must only establish that harm has occurred, then the operator is deemed to be responsible, regardless of whether it is the operator's fault. However, whereby an accident occurs, the operator (of power plant, enrichment or fuel and/or reprocessing facility) is responsible, irrespective of proof of any mistake or carelessness. This makes the legal action process less cumbersome by eliminating any impediments that could exist, especially with the burden of proof, considering the complexity of nuclear discipline. Simply, strict liability entails that a claimant does not need to prove the accident occurred⁴⁰⁵. The author contends that it is possible the claimant should prove the accident occurred and led to harm, but is not required to prove cause, or who was at fault.

⁴⁰⁴ Parties to Vienna Convention are mainly outside of Western Europe, including: Argentina, Bulgaria, Czech Rep, Egypt, Hungary, Kazakhstan (2011), Lithuania, Mexico, Poland, Romania, Russia, Saudi Arabia (2011), Slovakia, Ukraine, United Arab Emirates (2011). See also http://www.iaea.org/Publications/Documents/Conventions/liability_status.pdf Accessed on 23/04/2013.

⁴⁰⁵ See *Callow v Tillstone* cited from <http://e-lawresources.co.uk/Strict-liability.php> Accessed on 13/04/2013.

There may occur a situation whereby all claims are brought against the nuclear operator when an accident occurs and this is when, in terms of the operator, **Exclusive Liability** comes into place. This is regardless of the accident's cause. By implication, this means that suppliers or builders of the nuclear plant are protected from public legal actions when there is an accident. Here, the claimants need not prove who is responsible for the accident but again, according to the law, the nuclear operator bears it.⁴⁰⁶

It is mandatory that an operator of nuclear power plant is insured. The operator should ensure that there is availability of funds, either his or the insurers' to compensate for damages.⁴⁰⁷ The above describes **Mandatory Financial Coverage**, which guarantees availability of funds for payment of claims. States are able to make laws to set the minimum amount of protection, but in doing so must comply with international treaty obligations. It is obvious that the amount for mandatory protection has improved over time. This is due to inflation and equally permits increased responsibility on nuclear operators.

The **Exclusive Jurisdiction** principle makes it possible that only the courts of the country in which an accident has occurred have jurisdiction over claims for damages.⁴⁰⁸ The principle possesses two major effects: the first includes prevention of forum shopping - a situation whereby claimants search for courts and national legislation to support their claims. This suggests to the nuclear operator some measure of assurance and protection. Secondly, this principle also makes it possible for the competent court to be located close to the source of damage. Here, victims of nuclear damage do not need to travel far to register their claims. The combination of exclusive jurisdiction and exclusive liability make it possible for applicable courts to be easily reached, irrespective of the nature of the accident - whether it is transport-related and/or the affected company is also distantly situated.

⁴⁰⁶ See also http://www.iaea.org/Publications/Documents/Conventions/liability_status.pdf+ Accessed on 18/05/2013.

⁴⁰⁷ See also http://www.iaea.org/Publications/Documents/Conventions/liability_status.pdf+ Accessed on 18/05/2013.

⁴⁰⁸ See also http://www.iaea.org/Publications/Documents/Conventions/liability_status.pdf+ Accessed on 18/05/2013.

The essence of **Limitation of Liability** is to offer protection to nuclear operators; hence it is quite controversial.⁴⁰⁹ The question here is: is it fair to claimants? The level of limitation depends on the nature of damage. The researcher argues that it appears the essence of limitation of liability is to consider leverage on the part of the nuclear operator. The risks of an accident are efficiently mitigated by restricting the amount that operators must pay. Outside a certain level of damage, responsibility is passed from the individual operator to the state, or a collection of nuclear operators, or both. It therefore implies that this limitation recognises the benefits of power reaped from the nuclear source and the contained risks a state takes by authorising the construction and operation of power plants.

The aim of the principles discussed above is to guarantee that significant levels of compensation are accessible to victims, with a negligible level of court cases and complications in the case of an accident. Strict liability is accepted in exchange for a cap on liability, which creates certainty for insurers of operators, but if state or plaintiff can prove negligence, then there is no cap and liability is unlimited. The evaluation of these principles therefore suggests that their scopes have a huge impact on the determination of liabilities and payment of claims in the nuclear business. They allow for a well-planned implementation of claims based on the magnitude of damage(s) and this can be very beneficial to the UAE's nuclear programme.

4.5 Analysis of how countries using nuclear energy manage potential liabilities

Given that governments are aware of the risk of nuclear accidents causing trans-boundary harm, the development of international instruments to ensure that access to justice was readily available for victims outside of the country in which an accident occurred, became a reality. For countries to enjoy this provision, they must ratify relevant conventions. The researcher notes that the proliferation of different international instruments and their aims, regularly give rise to misunderstandings. Some of the most important instruments have been amended several times and are discussed below. It is also observed that not all member countries had consented to the earlier version, but have ratified the recent ones.

⁴⁰⁹ See also http://www.iaea.org/Publications/Documents/Conventions/liability_status.pdf+ Accessed on 18/05/2013.

For this reason, there is huge ambiguity and efforts towards the harmonisation of these regimes are in progress.⁴¹⁰ The UAE has ratified these instruments.

The development and use of nuclear power plants have been encouraged by many countries. Although the initial cost of these plants was high, there was still elevated demand for such methods of power production in all the developed nations. The management of nuclear active waste materials posed a challenge that required much debate. Most of the developed nations have now built extensive nuclear power projects to provide low-cost and steady power supply and have successfully managed these projects to standards. The countries that have entered nuclear power generation try to maintain a balance of the liabilities and profits of these projects. For this to happen, international codes of rules and regulations should be prepared so that those countries can adhere to them.

The major aspect to be considered by countries while setting up a nuclear power plant is to ensure that the plant is safe from radioactive emissions. The security from such hazards needs to be effectively tackled to minimise the possibility of higher liability for the state. Human tissues are susceptible to radioactive materials. According to experts, a minimum exposure to such radiation can lead to damage of human tissue. If a benchmark is decided by the countries in allowing exposure to such radioactive substances, it leads to occupational hazards and is against the morals of a sovereign state⁴¹¹.

The IAEA is endowed with the power to set a consistent standard regarding safe exposure to radiation, but there is no mechanism available to the said agency⁴¹². Therefore, there was a need to produce a set of rules that can define the permissible limits of radiation from a nuclear power plant or any nuclear active project, which can be controlled. This instrument does not provide for the procedures to be followed to make the nuclear project protected. It provides that the maximum limit of radiation a standard person can be

⁴¹⁰ Andrew Roman, Michelle Fernando, Cross-border Nuclear Liability, Partner, Miller Thomson LLP barristers & solicitor patent and trade mark agent, Available from http://www.millerthomson.com/assets/files/article_attachments/Cross-border_Nuclear_Liability.pdf Accessed on 29-06-2013.

⁴¹¹ Neal Smith and Michael Baram, (1987). "The Nuclear Regulatory Commission's Regulation of Radiation Hazards in the Workplace: Present Problems and New Approaches to Reproductive Health" 13 Ecology L.Q. 879.

⁴¹² Abel J. González, (2002). "The Debate on the Health Effects Attributable to Low Radiation Exposure" 1 Pierce L. Rev. 39.

exposed to over a period of three decades is five rems, although this dosage changes from person to person⁴¹³.

According to the British Safety Standards (BSS), states using nuclear power generation require strict adherence to the maximum limit of radiation emitted by the project.⁴¹⁴ To comply with such emission rates, the states are required to have constant supervision over the project. Yet the procedures to follow to keep the radiation below the BSS are not mentioned. Such procedures are adopted from the allied documents of the IAEA⁴¹⁵ although there are local agreements between nations within regions, to safeguard nuclear power plants from excessive radiation.

To safeguard nuclear power projects, the IAEA set up an 'Environmental Aspects of Nuclear Power Stations' as a part of the initiative to provide international safety standards⁴¹⁶. The difficulty in attaining maximum safety of nuclear power plants is due to the inability of all countries to accept a common set of regulations. The IAEA finds it difficult to coordinate this, despite its role to provide regulations to cater for safety issues in nuclear power stations.⁴¹⁷ The IAEA ensures the security of nuclear power plants during construction and functioning stages. It brought about the development of the 'Incident Reporting System'⁴¹⁸. The International Conference on the Safety of Nuclear Power in 1991 formed a comprehensive nuclear security and safety code for countries worldwide⁴¹⁹. The UAE considers this in its nuclear power programme.

The safety of nuclear power plants and the safeguarding of lives from radiation emitted by radio-active products need to be dealt with differently and the use of distinct codes of conduct is preferred. While the standards are totally different, the international

⁴¹³ International Atomic Energy Agency, Basic Safety Standards for Radiation Protection (1982) Safety Series No. 9.

⁴¹⁴ See International Atomic Energy Agency, Basic Safety Standards for Radiation Protection (1982) Safety Series No. 9.

⁴¹⁵ Elena Molodstova, "Nuclear Energy and Environmental Protection: Responses of International Law" (1994) 12 Pace Env'tl. L. Rev. 185.

⁴¹⁶ International Atomic Energy Agency, Environmental Aspects of Nuclear Power Stations (1971) Proceedings Series STI/PUB/261.

⁴¹⁷ International Atomic Energy Agency, The Agency's Programme and Budget for 1991 and 1992 XVII-XXI (1990).

⁴¹⁸ Int'l Atomic Energy Agency, International Atomic Energy Agency Illicit Trafficking Database, see: <http://www-ns.iaea.org/security/itdb.htm> Last Accessed June 7, 2013].

⁴¹⁹ Ibid. Int'l Atomic Energy Agency, International Atomic Energy Agency Illicit Trafficking Database.

legislations for these are the same. These legislations determine how domestic laws regarding nuclear safety and standards are often enacted as analysed in section 4.5.1 below. Due to the differences in national legislations that are already in practice, it is difficult and time consuming to produce a combined instrument that is acceptable to all countries⁴²⁰. The Convention on Nuclear Safety was adopted by nations with a view to combining the efforts of Euratom and the IAEA to enact two codes of standard which deal with safety of nuclear plants and safeguarding against radiation from nuclear active materials⁴²¹.

Also, many countries have adopted the Convention on Early Notification of Nuclear Accident and the Convention on Assistance in the case of a Nuclear Accident/Radiological Emergency. Here, the IAEA is responsible for preparing necessary mechanisms to supervise the standards and to help each nation be prepared to face nuclear accidents and radiological emergencies.

During the nuclear energy generation, the most hazardous stages are the final three, which include the extraction of uranium from the soil, the alteration of uranium to uranium oxide which can be used to produce the power and the management of nuclear waste, which poses damage to the environment as well as public health. It requires proper mechanisms to ensure protection of the flora, fauna and the environment from being harmed throughout these processes⁴²².

Yet another important part of nuclear power generation is the movement of nuclear active materials from one place to another. Since these materials are radioactive in nature, careful steps should be taken to avoid hazards associated with them. The Hazardous Material Transportation Act in the USA was the first of its kind to provide for a body to supervise the transportation of radioactive materials and to follow specific steps to reduce the hazards caused by such transportation⁴²³. Furthermore, there are recommendations

⁴²⁰Ibid. Int'l Atomic Energy Agency, International Atomic Energy Agency Illicit Trafficking Database

⁴²¹International Atomic Energy Agency, *International Atomic Energy Agency Illicit Trafficking Database*, <http://www-ns.iaea.org/conventions/nuclear-safety.asp>, Last Accessed June 7, 2013.

⁴²² Elizabeth V. Scott, (1985). "Unfinished Business: The Regulation of Uranium Mining and Milling" 18 U. Rich. L. Rev. 615.

⁴²³ Michele Mattsson, "Transportation of Radioactive Materials in Our Backyards - A State's Perspective" (1988) 9 J. Energy L. & Pol'y 47.

and rules framed by the IAEA to safeguard all transactions of radioactive materials and the UAE recognises them in its own nuclear power development. The right of innocent passage alone is a grey area which needs to be tackled under the guidelines of the IAEA⁴²⁴.

There are different methods of commercial transactions on radioactive wastes. For example, the USA and Japan are the foremost countries that reuse spent fuel. There are policies that deal with such businesses. These policies, along with safety standards are better dealt with domestically than on an international basis. While the General Agreement on Tariffs and Trade (GATT) can be made applicable to radioactive materials, there are certain characteristics peculiar to radioactive materials that make trading of nuclear substances ineffective when GATT guidelines are strictly followed.⁴²⁵ There is therefore requirement for another instrument that is more effective on nuclear materials trading than GATT⁴²⁶.

To some extent, the **USA** takes a different approach in managing and monitoring potential liabilities from nuclear energy production, and having been the first to embrace the concept, the country is party only to CSC (which is yet to be enforced) and no other international nuclear liability convention. The first comprehensive nuclear liability law which has been central to addressing issues of liability for nuclear accident since 1957 is the Price-Anderson Act.⁴²⁷ The Act provides \$12.5 billion coverage without involving the public or government and no fault is to be proven. It covers power reactors, research reactors, enrichment plants and waste repositories. This can be a good lesson for the UAE.

In 2005, the Act was renewed for a period of 20 years with good bi-partisan support, and entails that individual operators should be liable for two levels of insurance cover.⁴²⁸

⁴²⁴ Lawrence Marín, "Oceanic Transportation of Radioactive Materials: The Conflict between the Law of the Seas' Right of Innocent Passage and Duty to the Marine Environment" (2001) 13 Fla. J. Int'l L. P. 361.

⁴²⁵ Lutz Strack, The Safety Regime Concerning Transboundary Movement of Radioactive Waste and its Compatibility with the Trade Regime of the WTO. [Online]: Available: http://www.oecd-nea.org/law/nlb/nlb-73/025_049.pdf, Accessed June 7, 2013

⁴²⁶ Ibid Lutz Strack, The Safety Regime Concerning Transboundary Movement of Radioactive Waste and its Compatibility with the Trade Regime of the WTO.

⁴²⁷ Centre for Nuclear Science and Technology Information. The Price-Anderson Act: Background Information. [Online]. Available at: http://www.nuclearconnect.org/wp-content/uploads/2014/07/54_PriceAnderson_Background.pdf Accessed on 25-02-2015.

⁴²⁸ See Centre for Nuclear Science and Technology Information. The Price-Anderson Act.

Firstly, each nuclear site is required to obtain US\$375 million liability cover (as of 2011) provided by a pool of private insurance [American Nuclear Insurers (ANI)].⁴²⁹ The above involves financial liability and not lawful liability as in European liability standard.

According to the World Nuclear Association (WNA), all US reactor operators have mutually provided for the second layer or Secondary Financial Protection (SFP) plan and this is funded through traditional payments, if required, of up to \$112 million per reactor, per accident, composed in annual repayments of \$17.5 million (and in tune with inflation).⁴³⁰ The Department of Energy meanwhile, also makes available \$10 billion for its nuclear activities and the entire terms come to more than \$12.2 billion, paid for by the utilities.⁴³¹ Congress, otherwise regarded as ‘insurer of last resort’ would have to choose the way damages is provided when a major accident occurs, but only if the amount is beyond the above-mentioned cover, irrespective of mistake⁴³².

The Nuclear Installations Act of 1965 in the **UK** provides for recompense for harm/damage sustained, in cases where the law has been breached during routine, normal functioning/operation of nuclear power plants. The Act also makes provision for strict liability of nuclear power projects operators, but only on the condition that the damage caused from such plants is radiation related. To clarify, if such radiation causes any damage, the operator is exclusively responsible and there are no circumstances under which the operator’s fault would even have to be proved. Here, the law of negligence is relevant to an extent, especially when the injury caused is not only expected but accessible⁴³³.

A new limit of liability was stated for specific installation after the UK Energy Act of 1983 brought legislation in to line with the revisions of the Paris/Brussels Conventions.⁴³⁴ Each major installation was provided with a limit of £140 million in 1994 to make sure

⁴²⁹ See Centre for Nuclear Science and Technology Information. The Price-Anderson Act.

⁴³⁰ World Nuclear Association (August 2013). Liability for Nuclear Damage available from <http://www.world-nuclear.org/info/Safety-and-Security/Safety-of-Plants/Liability-for-NuclearDamage/> Assessed on 21-12-2014.

⁴³¹ Ibid World Nuclear Association (August 2013).

⁴³² See also World Nuclear Association (August 2013).

⁴³³ Blue Circle Industries v Ministry of Defence [1999] 2 Ch. 289.

⁴³⁴ Nuclear Engineering International (27 March 2011). Liability for nuclear accidents - how is it handled? [Online] Available at: <http://www.neimagazine.com/opinion/opinionliability-for-nuclear-accidents-how-is-it-handled/> Last accessed on 24-09-2013.

the operators were liable for claims up to this amount.⁴³⁵ 16 Lloyd's syndicates and 8 insurance companies form a pool in UK recognised for providing much of this insurance (Nuclear Risk Insurers). The present Paris/Brussels system is applied beyond this UK £140 million, where the government contribution would be SDR 300 million (c €360 million).⁴³⁶

During late 2012, legislation was proposed by the UK government which required EUR 1.2 billion insurance by the operators.⁴³⁷ The 2004 Paris/Brussels Protocol requires that EUR 700 million be set as the initial level and then an annual increase of EUR 100 million takes place.⁴³⁸ When financial security measures and commercial insurance are not present in the private market, the nuclear operators are provided with indemnity, waivers and government provided insurance. In the year 2011, a public consultation over this proposal took place.⁴³⁹

Operators of nuclear plants are supplemented by two mutual insurance arrangements along with the commercial insurance pool in Europe. In 1978, the European Mutual Association for the Nuclear Industry (EMANI) was founded, followed by the European Liability Insurance for the Nuclear Industry (ELINI) in 2002. As a third-party cover, the ELINI plans to provide EUR 100 million and as a special capital fund, the 28 members would need to contribute half the amount by late 2007.⁴⁴⁰ Most of the EU nuclear plant operators are members of the ELINI and the EMANI incorporates nearly 100 sites, with 70 members. There are nearly EUR500 million as funds present, covering most of Europe.⁴⁴¹

Individual nations in Europe have their legislations in congruence with the international conventions and the caps set also change overtime. There exists an unlimited operator liability for Germany; the operator is required to provide €2.5 billion as security for each

⁴³⁵ See Nuclear Engineering International (27 March 2011).

⁴³⁶ Ibid. Nuclear Engineering International (27 March 2011).

⁴³⁷ See World Nuclear Association (August 2013).

⁴³⁸ Ibid World Nuclear Association (August 2013).

⁴³⁹ Ibid World Nuclear Association (August 2013).

⁴⁴⁰ Antony Froggatt and Simon Carroll (2010). Third Party Insurance: The Nuclear Sector's "Silent" Subsidy in Europe. pp 555-625. [Online]. Available at: [mercury.ethz.ch/serviceengine/Files/ ISN/126193/ .../en/ch+13.pdf](http://mercury.ethz.ch/serviceengine/Files/ISN/126193/.../en/ch+13.pdf) Last accessed on 25-09-2013.

⁴⁴¹ See Antony Froggatt and Simon Carroll (2010).

plant.⁴⁴² Insurance covers part of this security, which is €256 million for each plant. France requires a security of EUR 91 million, while €600 million is to be insured by operators from Switzerland which has signed, but not ratified the international conventions yet.⁴⁴³ This nation proposes an increase of €1.1 billion along with ratifying the Paris and Brussels Conventions.⁴⁴⁴

The laws of **Japan** conform to the international liability conventions, but the country is not party to any, which includes: The Law on Compensation for Nuclear Damage and the Law on Contract for Liability Insurance for Nuclear Damage.⁴⁴⁵ These laws are revised every ten years. An exclusive liability is provided to the plant operator whereby he must provide a financial security amount of JPY 120 billion (US\$ 1.4 billion) that was half the amount in 2010.⁴⁴⁶ If the damage caused was by a major natural disaster of an exceptional nature, then the liability of the operator may be relieved by the government. The liability remains unlimited in any other case.

In the year 2011, the government set up a state backed institution to help those affected by the Fukushima accident by expediting payments. This institution would receive financial contributions from those electric power corporations with nuclear power plants in Japan and special bonds would be provided by the government to be cashed when required. JPY 5 trillion (\$62 billion) totals the government bonds.⁴⁴⁷ Other nuclear power generators would also be represented by this institution, which behaves as an insurer for the industry too. In addition, this institution plans and makes provision for any future nuclear accidents. The nuclear operator provisions for contributions are very much like those of the USA. The government's expectations are that in 10 to 13 years' time, TEPCO will have been able to complete its repayments. From there on, it will no longer have government involvement and will have become a completely private organisation. The government would then be paid an annual fee for support, plant safety would be ensured and adequate level of supply would be maintained.

⁴⁴²The Energy Library (2009). Civil liability for nuclear damage. [Online] Available at: <http://theenergylibrary.com/node/338> Last accessed on 24-09-2013.

⁴⁴³ See: The Energy Library (2009). Civil liability for nuclear damage.

⁴⁴⁴ See: The Energy Library (2009). Civil liability for nuclear damage.

⁴⁴⁵ World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance. [Online]. Available at: <http://www.world-nuclear.org/info/Safety-and-Security/Safety-of-Plants/Liability-for-Nuclear-Damage/> Accessed on 18-02-2014.

⁴⁴⁶ See World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance.

⁴⁴⁷ Ibid World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance.

The Tokyo Legal Affairs Bureau received deposits totalling JPY 120 billion (about \$1.56 billion) from TEPCO in January 2012, as insurance coverage for the organisation's nuclear energy facilities.⁴⁴⁸ Initially, the Japan Atomic Energy Insurance Pool covered the utility, which was an industry organisation consisting of 23 non-life insurers. In mid-January 2012, the contract with TEPCO was to expire and in August 2011, the Pool stated that it would not be renewing their contract. About accident liability coverage, Japanese nuclear utilities are obligated to secure JPY 120 billion.⁴⁴⁹ Private-sector insurers are being sought by TEPCO for coverage. JPY 1 billion as insurance and the balance of JPY 13.5 billion by the parent company (Sumitomo) were paid after the 1999 Tokai-mura fuel plant serious accident.⁴⁵⁰

The 2004 Joint Protocol relating to Paris and Vienna Conventions has been ratified by **Finland**. Based on this convention coming into force, a 2005 Act was implemented whereby it was required that operators maintain a €700 million insurance cover, minimum.⁴⁵¹ At present, the level is maintained at EUR 300 million, while beyond € 1.5 billion, the operator liability becomes unlimited, based on the Brussels Convention.⁴⁵² The revised Paris Convention states the Nuclear Damage concept and it moreover includes terrorism hypotheses.

The 2004 Joint Protocol relating to the Paris and Vienna Conventions have also been ratified by **Sweden**. Insurance of SEK 3300 million (EUR 345 million) is the least amount possible required by the country according to the Nuclear Liability Act and the State would then be obliged to contribute SEK 6 billion per incident beyond this as cover.⁴⁵³ It has also been observed that Sweden is analysing the EUR 700 million operator's liability under the Joint Protocol amending the Paris Convention and is also announcing unlimited operator liability.

⁴⁴⁸ Ibid World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance.

⁴⁴⁹ Ibid World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance.

⁴⁵⁰ Ibid World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance.

⁴⁵¹ International Atomic Energy Agency. Finland 2011. [Online]: Available at: http://wwwpub.iaea.org/MTCD/Publications/PDF/CNPP2011_CD/countryprofiles/Finland/Finland2011.htm Accessed on 17/12/2014.

⁴⁵² See International Atomic Energy Agency. Finland 2011.

⁴⁵³ See World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance.

The amendment to the Vienna Convention is being ratified by the **Czech Republic** and the mandatory insurance coverage for each reactor became CZK 8 billion (EUR 296 million) in 2009.⁴⁵⁴

The international Conventions and Nuclear Liability and Compensation Act are consistent with each other in **Canada**. There exists an absolute and exclusive liability for third party damage to the licensee. An absolute discharge of liability is provided to the goods and services suppliers. The insurance cover was set at a limit of C\$75 million per power plant in 1976 for individual licensees, but was increased to C\$650 million as part of the 2008 Act.⁴⁵⁵ However, this Act has not been passed yet. Claimant is not required to prove where fault lies; only injury may be highlighted, with cover provided by a pool of insurers. The government would provide the funds, which may be required beyond the cap level.

Since 2005, **Russia** has been party to the Vienna Convention. The Russian Association of Nuclear Insurers (RANI)⁴⁵⁶ has been managing the domestic nuclear insurance pool, which consists of 23 insurance organisations covering a \$350 million liability. A reinsurance arrangement with China and the Ukraine was initially carried out, but since 2009 there have been 28 nations forming a part of the Russian Pool, because it became a member of the International Pooling System. The new build in India has been asked by Atomstroyexport to be covered, as civil liability of US\$ 5 to 10 billion level by RANI.⁴⁵⁷

A domestic liability law was adopted by the **Ukraine** in 1995, but it was soon revised to bring it into harmony with the Vienna Convention. This Convention joined in the year 1996 and is party to the Joint Protocol signed by the CSC. 150 million SDRs (c €180 million) is the cap for operator liability.⁴⁵⁸ Coverage needs to be extended outside the Vienna Convention countries, which is why the special provisions apply to the Chernobyl shelter.

⁴⁵⁴ Ibid World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance.

⁴⁵⁵ Ibid World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance.

⁴⁵⁶ See Russian Association of Nuclear Insurers (RANI). Available at: <http://ranipool.ru/eng/> Accessed on 27-08-2013.

⁴⁵⁷ See Russian Association of Nuclear Insurers (RANI).

⁴⁵⁸ Ibid World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance.

China is an active member of the international insurance pooling system, but it is not party to any international liability. Once the fuel is loaded in the reactor, it covers first party risks as well as the third-party liability. The State Council issued an interim domestic law in China in 1986, which encompasses the international Conventions as well as the liability limits, which increased to international levels in September 2007. A symbol more than substance has been observed after a reinsurance arrangement was set up with Russia.⁴⁵⁹

For plant insurance, more than half of China's nuclear power insurance market has been provided by Hong Kong-listed Ping'an Insurance Company.⁴⁶⁰ The clients include the first and second phase projects of Qinshan Nuclear Power Station in Zhejiang and the nuclear power plants in Guangdong. To the Tianwan Nuclear Power Station in Jiangsu, four Chinese insurance organisations provided nearly US\$ 1.85 billion worth of insurance and most of this would be reinsured internationally. Ping'an, All Trust, CPIC, PICC and others have provided RMB 40 billion (\$5.85 billion) insurance for the EPR first two units at Taishan nuclear plant.⁴⁶¹ An RMB 100 billion insurance cooperation agreement with China Guangdong Nuclear Power Co was signed by seven insurance organisations and China Power Investment Corporation (CPI) in late 2009, to insure that 10 CPR-1000 units would be built by CGNPC in the next 3 years.⁴⁶² In December 2007, a US\$2 billion insurance arrangement was announced by Ningde Nuclear Power, in agreement with Ping An Insurance Corp in Fujian province, for the 4-unit CPR-1000 nuclear power project. This agreement was limited to first part cover only.⁴⁶³

The nuclear liability of the **Indian** government is in line with international levels aided by the Nuclear Act that has been passed. The operators are held liable for nuclear accident(s) and no third-party supplier protection is to be provided. Insurance to be taken by the operators up to the liability cap of \$110 million and several other provisions which are part of the IAEA's Vienna Convention (1997 amendment).⁴⁶⁴

⁴⁵⁹ Ibid World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance.

⁴⁶⁰ Ibid World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance.

⁴⁶¹ See Ibid World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance.

⁴⁶² See Ibid World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance.

⁴⁶³ See Ibid World Nuclear Association, (2015). Liability for Nuclear Damage: Nuclear Insurance.

⁴⁶⁴ See International Atomic Energy Agency IAEA.

4.5.1 Analysis and evaluation of above countries in relation to UAE

Generally, most of the countries which have nuclear power plants have taken up their legal liability to damage caused by nuclear power plants, as stipulated by the Paris Convention. The Vienna Convention on Civil Liability also considered the countries while drafting legislations to deal with damage caused by radioactive substances.⁴⁶⁵ According to the UK's legislation, the damage caused by nuclear power stations can be claimed only within thirty years of its occurrence. The Paris Convention has restricted the upper limit of compensation payable to victims damaged by nuclear accident, capping it at 1500 Euros.⁴⁶⁶ The researcher argues that in the present-day economy, 1500 Euros is a very small amount for a victim to get for the harm he suffers from a nuclear disaster. This is more like not being compensated at all.

The transportation of nuclear active products may also lead to damage, during transfer. The responsibility for such damage rests with the person who holds the licence for such movement⁴⁶⁷. When nuclear active materials are relocated from one place to another, the transporters are liable for any damage caused during the transfer, unless such a person was unaware of the nuclear nature of the materials⁴⁶⁸. The UAE has formulated a law regarding the transportation of radioactive materials. While the responsibility of harm caused by the movement of radioactive materials rests with the carrier, the injured party cannot bring claims against the carrier for the damage caused. The operator who holds the licence is made liable for the damages caused during the transit of such materials. Even if the damage is caused by the actions of the transporters, the injured can claim the amount of compensation only from the operator. Later, the operator or the insurer may claim back the amount from said carrier whose fault it was that the damage occurred⁴⁶⁹.

The method of calculating the liability of nuclear operators differs between countries. Some nations imbibe the international system of liability, while some have their own methods of calculating the liability for nuclear accidents. These are examples the UAE

⁴⁶⁵ Vienna Convention on the Civil Liability.

⁴⁶⁶ The Paris Convention.

⁴⁶⁷ Monika Hinteregger (2006). "The New Austrian Act and Third Party Liability for Nuclear Damage" 35 *Denv. J. Int'l L. & Pol'y* 193.

⁴⁶⁸ Ibid.

⁴⁶⁹ SCM Presentation 16, A. Blanco-Bazan, *Overview of Existing and Applicable International Instruments*, Note by the IMO Secretariat.

could consider. There are other nations that do not have systems in place to deal with liability for nuclear accidents. The ambiguities in the legislation between nations make the liability of nuclear operators dubious. This increases the risks of nuclear reactors and thereby decreases the number of investors in this arena.⁴⁷⁰ The absence of a unified system determining the investors' liability will affect the system, detrimentally. Moreover, the increase in liability for operators would result in an increase in the cost of power. Some of the domestic legislations allow for unrestricted amounts of compensation for those injured in or by nuclear accident(s), while the international legislation stipulates a restricted amount for compensation. The disparity in the limits on compensation available obviously affects the amount of compensation received by victims.⁴⁷¹

Insuring the nuclear power plant is an important factor in nuclear power projects, since there is always a high risk nuclear accident(s) might occur. In case of a nuclear accident, the amount for which the nuclear operator is liable is high in some countries, in contrast to the upper limit cap for compensation set internationally. Usually, insurance policies available for nuclear operators are limited to a certain time, since an insurance policy has always been risky to the insurer. Insurance companies do not usually cover those claims that have caused damage outside the territory of the country in which the plant is situated or for damage caused whilst moving the radioactive material from one place to another. The Protocol of 2004 increased the higher limit of compensation available, which augments the premium amount. In order to satisfy credibility, the researcher believes that the UAE will have to consider the above deviations regarding insurance coverage.

There is no international regulation on arms control or disarmament. This is left to the sovereign's discretion. Pertaining to this, there are various agreements entered into by different countries within the region, through bilateral and multilateral treaties which deal with the prohibition of arms and disarmament⁴⁷². There is further clarification regarding the harm potentially caused by nuclear weapons and how the collection of such armaments would result in conflicts among nations, which could in turn, lead to the

⁴⁷⁰ See SCM Presentation 16, A. Blanco-Bazan.

⁴⁷¹ Ibid SCM Presentation 16, A. Blanco-Bazan.

⁴⁷² Vienna Convention on the Law of Treaties of May 1969, 1155 U.N.T.S. 331 (entered into force January 27, 1980).

destruction of both the environment and of national security. This resulted in the Test Ban Treaty, in 1963⁴⁷³.

4.6 International Nuclear Event Scale (INES) and Analysis of specific legal liability concerns arising from recent nuclear incidents, including lessons that UAE can learn from these

The first nuclear power plant was established in the UK in 1956, to cater for the ever-increasing power needs of that country⁴⁷⁴. The development of nuclear power plants around the world have been mainly affected by two factors: international community fears that the effects of nuclear emissions could damage the environment, as well as humans⁴⁷⁵; and the uncertainty of the legal developments regarding nuclear power generation, which can result in huge losses to the investors if there were accidents⁴⁷⁶. The author views that risks to commercial activities should not be regarded as a valid set of objections, given the scale of potential harm they represent.

In order to understand the level of severity of nuclear incidents around the world, it is important to understand the International Nuclear Event Scale (INES) (see Diagram 8, next page).

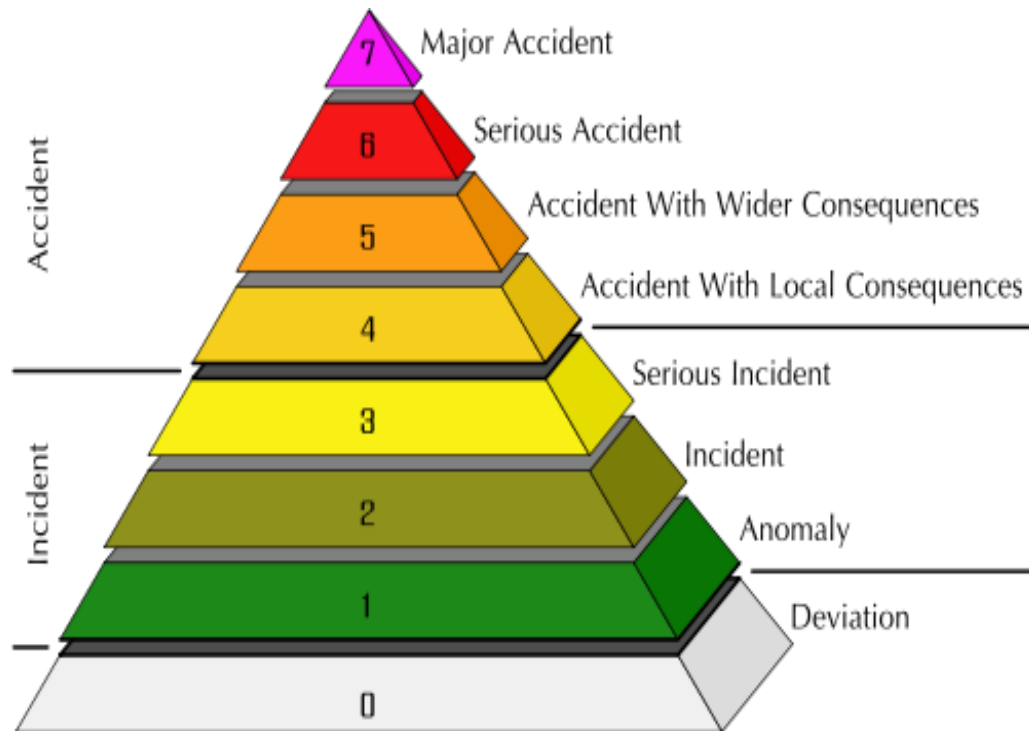
⁴⁷³ Treaty Banning Nuclear Weapon Test in the Atmosphere, in Outer Space and under Water, UK, USSR, US, August 8, 1963, 480 U.N.T.S. 43 (hereinafter TBT); Allan Gotlieb, *Disarmament and International Law* (Canadian Institute of International Affairs, 1965), pp. 28-32, 44-50.

⁴⁷⁴ World Nuclear Association, 'Outline History of Nuclear Energy', (2010), Available at <http://www.worldnuclear.org/info/inf54.html> Accessed 7 June 2013.

⁴⁷⁵ Patricia Birnie, Alan Boyle and Catherine Redgwell, *International Law and the Environment*, (3rd Ed., OUP, 2009), 488.

⁴⁷⁶ Michael Trebilcock and Ralph A. Winter, 'The Economics of Nuclear Accident Law', (1997), 17 *International Review of Law and Economics*, 215. Available at <http://www.sciencedirect.com/science/article/B6V7M-3SX0D9N-6/2/7ab1a7bcef3e88269e5a1e1adad1b276> Accessed 3 June 2013; Suvrat Raju and M. V. Ramana, 'The Other Side of Nuclear Liability', (2010), XLV (16) EPW, 48.

Diagram 8: International Nuclear Event Scale (INES)



Source: www.iaea.org

Introduced in 1990 by the IAEA, the International Nuclear and Radiological Event Scale (INES) facilitates timely communication of major information regarding safety during nuclear accidents⁴⁷⁷. The Scale is an established guide for the determination of the impact of any nuclear incident or accident due to operational failure of nuclear plants. This is comparable to the moment that magnitude scale is used to explain the relative degree of earthquakes.

On the INES scale, every escalating level characterises a disaster about ten times more severe than the preceding level. In a situation, whereby the intensity of the event can be quantitatively assessed (in contrast to earthquakes), the severity level of an artificial disaster, such as a nuclear accident, is more subject to explanation.

After an incident occurs, the INES level of such incident is assigned. This is due to the difficulty in interpretation. Hence, it has a very limited capability for providing support in disaster-aid deployment. INES ratings are not allocated by a central body; high-profile

⁴⁷⁷ World-nuclear-news.org. 6 October 2008. "Event scale revised for further clarity". Retrieved on: 13 September 2010.

nuclear incidents are occasionally assigned INES ratings by the operator of the nuclear plant; by the formal body of the country; also by scientific institutes; international authorities or even other experts, which may bring about uncertainty as to the definitive scale of severity. The researcher argues that it is neither reasonable nor objective for INES ratings not to be allocated by a central body. It should not be permissible that the operator gauge the extent and nature of harm (or damage), rather, this should be proved by neutral parties. This will ensure that correct information is presented.

It is therefore important to briefly analyse the Chernobyl, Fukushima, Three Mile Island and Windscale incidents, before looking at the legal liabilities that arise at the time of such accidents. Assessing the nature of an incident/accident can help to determine the scale of the harm caused and the potential legal liabilities of parties concerned. To fully appreciate the scope of legal liabilities it is helpful to consider the nature of previous incidents so as to determine and clarify the parameters of such liabilities. Thus, there have been four major incidents worldwide that can aid us in assessing the issues here, and from which the UAE can learn valuable lessons for its own nuclear power development.

4.6.1 The 1957 Windscale accident in the UK

While the Three Mile Islands accident is treated as the most serious in the history of US commercial nuclear reactors, the release of radioactive substances in October 1957, following the accident at Windscale in Northern England, was considered to be of greater concern than Three Mile Island. This accident was rated at Level 5 on the INES. This means that the accident had wider consequences or impact on people and the environment.

The nuclear accident marked a turning point in the annals of the nuclear industry. The end of the Second World War marked the beginning of the super-powers opting for nuclear capabilities. This led the British government's quest for nuclear attainment and the urge to build its own atomic bomb. In furtherance of this goal, the nuclear installation was sited at the village of Seascale, Cumbria, while the reactors built were referred as 'Windscale Pile 1 and 2'.

In the Windscale accident, a fire in the graphite core of the Windscale reactor burned continuously for several days. The radiation fallout resulted in some of the milk from cows in the surrounding area showing radioactivity levels at milking time as high as 800,000 picocuries per litre - 40 000 times the levels observed at Three Mile Island.⁴⁷⁸ Dr. John Rundo of Argonne National Laboratory observed that the environmental consequences of Three Mile Island are considered to be a lot less significant than the Windscale accident.

On 11th October, at about 9 am, the core of the reactor was flooded with water and this continued for several hours; by that evening the fire was extinguished. In the aftermath of the accident, it was thought that an estimated 700 terabecquerels (20,000 curies) of radioactive materials had been dispersed into the countryside.⁴⁷⁹ Very little effort has been done for relocation or for evacuating the people away from the surrounding areas. The best efforts of the agencies in charge was the concern that milk within the surrounding area could have been hazardously contaminated; so, milk within a radius of 500 km² of the site was destroyed for about a month.⁴⁸⁰

Recent studies have shown that about 18.6PBq of radioactivity was released, made up components such as 1.8PBq of I (Iodine) and 42TBq of Po (Polonium).⁴⁸¹ An immediate concern then was the radioactive isotope iodine-131 which, though it had a life of eight days was nevertheless dangerous, as it is absorbed by human beings and stored in the thyroid, often leading to cancer of the thyroid. It was also thought that this accident caused about 200 cancer cases, but recent studies have shown the figure may have been higher.⁴⁸² The accident was widely reported in the media and within a few days, the government had set up a board of inquiry, whose summary findings were made public within a month.

Information on the actual magnitude and the dispersion of radio nuclides in the environment has been made public and re-published to mark the anniversary of the event.

⁴⁷⁸ See Arnold, L. (1992). *Windscale (1957)*.

⁴⁷⁹ Arnold, L. (1992). *Windscale (1957). Anatomy of a Nuclear Accident*. St. Martin's Press. New-York, pp. 9-43

⁴⁸⁰ See Arnold, L. (1992). *Windscale (1957)*.

⁴⁸¹ Garland, J. A. (2007). Atmospheric Emissions from the Windscale Accident of October, 1957. *Atmospheric Environment*. Vol.41, Issue 18, pp. 904-3920 at p 3917.

⁴⁸² Wakeford, R. (2007). *The Windscale Reactor Incident-50 Years on*. *Journal of Radiological Protection*. Vol. 27, Issue 3, Article EO2, pp. 211-215.

The Board of Enquiry met under the chairmanship of Sir William Penny and at the end of its sitting issued what was termed the ‘Penny Report’. On the 26th October 1957, it arrived at four conclusions⁴⁸³:

- i. The primary causative factor for the accident was the second nuclear heating applied too soon and too rapidly on 8th of October. The researcher observes that this suggests negligence by the operator was the cause of the incident.
- ii. The steps taken by the operators in dealing with the disaster were without delay, efficient and showed substantial commitment to responsibility. This shows that it was not negligence.
- iii. The measures adopted to deal with the accident were sufficient, as there was no instantaneous harm to the wellbeing of the public or plant workers; but it queried technical and organisational deficiencies. The researcher observes that this must do with operational management, which was not negligence but strict liability.
- iv. Recommendation that a more detailed technical assessment was needed, anticipating organisational changes, better defined radiation dose limits and redefined responsibilities for health and safety.⁴⁸⁴

The magnitude of contamination deduced by recent studies, revealed that the radioactive dispersion which took place between the afternoon of 10th of October and the evening of the 11th, had peak emission rates. The first peak had winds transporting the emissions eastward, while the second peak had the emissions being transported south/south-eastward. In effect, this meant that the plumes from Windscale were detectable in Europe and Scandinavia and to this extent, radioactivity was detected at Mol in Belgium; Frankfurt in Germany and Holland; and the Scandinavian States within the first three/four days of the accident.⁴⁸⁵

⁴⁸³ See Arnold, L. (1992). *Windscale (1957)*.

⁴⁸⁴ See Arnold, L. (1992). *Windscale (1957)*.

⁴⁸⁵ Bergan, T. et al (2008). *On the Occurrence of Radioactive Fallout over Norway as a Result of the Windscale Accident*, October, 1957. *Journal of Environmental Radioactivity*. Pp 50-61 at p. 51

The Windscale site was eventually decontaminated and is still in use, with some parts of it being transferred to BNFL, called Sellafield. The whole site is now owned by the Nuclear Decommissioning Authority (NDA). In fact, in the Windscale accident, radioactivity has extended to Leeds, which is around 100 miles away and the radioactivity in milk was nearly 40 000 picocuries per litre on October 16, a week after the accident. Also, there was a 10% increase in background radiation at Leeds, which was a result of radioactivity being deposited on the ground.⁴⁸⁶ The British farmers received compensation for their losses.

In contrast, at Three Mile Island, up to May 4, 1979, the NRC had reported no noticeable radiation in soil or water samples taken near the station. There appeared to be traces of radioactive iodine in milk, however it was twenty picocuries per litre, which is far below the Food and Drug Administration's recommended action level of 12,000 picocuries per litre.⁴⁸⁷ There was no compensation awarded in this instance, the reason being that the notification of the incident was not immediately reported.

4.6.2 The 1979 Three Mile Island accident in the USA

One of the major nuclear disasters of a US commercial nuclear reactor is the accident which occurred in the Three Mile Island Unit 2 (TMI-2) reactor, near Middletown, Pa., that partially melted down on March 28, 1979.⁴⁸⁸ The Three Mile Island accident was rated at Level 5 on the INES, meaning that there were wider consequences or impacts upon people and the environment. It was the same level as Windscale on the INES. Although the small radioactive releases did not have any detectable health effects on plant workers or the public,⁴⁸⁹ this accident has been significant in bringing about major changes which involve emergency response planning, human factors engineering, reactor operator training, radiation protection, as well as focus on several other areas of nuclear power plant operations. It also caused the Nuclear Regulatory Committee (NRC) to

⁴⁸⁶Mitchell Rogovin, Three Mile Island - A report to the commissioners and general Public. [Online]: Available at: <http://www.threemileisland.org/downloads/354.pdf> Last visited 28 February 2014.

⁴⁸⁷ See Mitchell Rogovin.

⁴⁸⁸The Three Mile Accident Report. [Online]: Available at: <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.pdf> Last accessed 27 February 2014.

⁴⁸⁹Ibid: The Three Mile Accident Report.

tighten and heighten its regulatory oversight. These changes have contributed in a major way toward increasing U.S. reactor safety.⁴⁹⁰

During the accident, the main concern was regarding the hydrogen bubble forming within the containment building.⁴⁹¹ If large amounts of radiation leakage took place in the environment, it was expected an explosion would occur in the containment building. However, this risk was resolved, since the oxygen levels present within the building reduced the likelihood of explosion.⁴⁹²

The government's angry reaction to the incident was criticised by the industry.⁴⁹³ The public lacked information in the first two days, when the risk was largest. The public's anxiety worsened after the hydrogen bubble incident was brought under control and public risk reduced. This was mainly due to misinformation regarding the hydrogen bubble worries, confusion and the inadequate actions of the government towards the local community, which escalated fears.

It is quite understandable how the industry reacted over the exaggerated response, but they did not fully comprehend how, in the first two days the government, as well as the industry, acted inadequately concerning the public's rights regarding risk(s). If a catastrophic accident takes place, there is a public right to know and TMI did not honour this.⁴⁹⁴ The author poses that this is legal liability which has negated the freedom of information. This also encouraged the public to lose faith in the nuclear industry.

The NRC and the industry were taught by the TMI that if equipment fails, human operator presence would not necessarily be able to improve the situation.⁴⁹⁵ Considering the potential seriousness of an accident, the Kemeny Commission Report addressed the assumptions of this mind-set. The Three Mile Island was a serious nuclear accident and preventing these in future, would require fundamental changes in the practices,

⁴⁹⁰ A brief review of the accident at Three Mile Island. [Online]: Available at: <http://www.iaea.org/Publications/Magazines/Bulletin/Bull215/21502795459.pdf> Last accessed 27 February 2014.

⁴⁹¹ Kemeny, John G. et al., (1979). Report of The President's Commission on The Accident At Three Mile Island 51.

⁴⁹² Ibid. Kemeny, John G. et al., (1979).

⁴⁹³ World Nuclear Association, Information and Issue Briefs, Three Mile Island: 1979, <http://www.world-nuclear.org/info/inf36.htm> Last accessed 22 February 2014.

⁴⁹⁴ Ibid. Kemeny, John G. et al., (1979).

⁴⁹⁵ Ibid. Kemeny, John G. et al., (1979).

procedures and organisational aspects. Also, the attitudes of the nuclear industry and the Nuclear Regulatory Commission needed to be changed.⁴⁹⁶ The industry and the NRC were convinced, having previously assumed the absence of serious accidents proves/illustrates that the technology is safe. This attitude must be changed, according to the Commission and it is essential to understand that nuclear power has a potentially dangerous nature and that safeguards must be present always to prevent any accidents. Human beings and equipment must be treated with equal respect and for this a comprehensive system is needed.⁴⁹⁷ After this report, the training of the operator became the focus for improvement(s).

Under the Energy Reorganisation Act of 1974, the newly established NRC was obliged to be banned from promoting nuclear power.⁴⁹⁸ It was observed by the Commission however, that the NRC did not abandon the prior mission completely, indeed was still trying to nurture the growing industry. There was also failure on the part of the NRC to communicate the safety issues present to those facilities with similar reactors, because it was discovered that prior to TMI, an accident had taken place in another plant, which involved an error in turning off the cooling system, hence, the lesson learned from one plant was not communicated to the rest of the industry⁴⁹⁹.

A senior engineer believed that they were lucky the error committed did not lead to a serious accident, as under similar circumstances a very serious accident could indeed arise. The researcher proposes that this suggests negligence and culpability. It was required that clear instructions be sent out to the operators for safeguarding. The Memorandum had been written thirteen months before the Three Mile Island accident took place, regrettably no new instructions resulted.⁵⁰⁰

The utility was functioning under nuclear reactors that consisted of unpredictable and un-assessed conditions. This would indeed be disturbing. An NRC Special Inquiry Group

⁴⁹⁶ Ibid Kemeny, John G. et al., (1979).

⁴⁹⁷ Ibid Kemeny, John G. et al., (1979).

⁴⁹⁸ Ibid Kemeny, John G. et al., (1979).

⁴⁹⁹ See Kemeny, John G. et al., (1979).

⁵⁰⁰ Ibid Kemeny, John G. et al., (1979).

presented a report to the Commissioners in which it was stated that nearly 2 meltdowns took place at the core on the first day.⁵⁰¹

According to the estimates in the report, the reactor was within 30 to 40 minutes of meltdown, but incomplete information meant the core's condition was misunderstood and in reality, the reactor meltdown was in 4 hours (not 30-40 minutes). Finally, after the initial confusion cleared, both agency and industry observed the TMI Unit 2 core had been subjected to a partial meltdown 1 year and 1 day after it was subjected to the first criticality.⁵⁰² This indicates there was negligence - breach of duty on the part of the operator. President Jimmy Carter after the Three Mile Island case stated that the nation's nuclear power is the last resort for sourcing energy and it is necessary that conservation goals be met. The lesson learnt here which could be useful to the UAE, is that information regarding nuclear reactors should be precisely relayed to all those concerned.

On 10 April 1979, the Chairman of the NRC, Joseph M. Hendrie, when testifying before the Senate Subcommittee on Nuclear Regulation in the US had reportedly told Senator Pete Domenici that the possibility of a flammable mixture turned out to have been a misplaced concern.⁵⁰³ According to the April 1979 information bulletin of the Atomic Industrial Forum (AIF), Hendrie further explained that it took the NRC a few days before its analyses showed that "there hadn't been any oxygen involved or very little, if any."⁵⁰⁴

Here, a fund was set up on the grounds of strict liability. Anyone who applied could recoup from the fund and the evidential requirements were very low. This was due to previously stated overreaction from the government and public. The UAE can benefit from this lesson as 'good practice' for the future.

4.6.3 The 1986 Chernobyl Accident

The Chernobyl plant was regarded as a catastrophe with Level 7 event on the International Nuclear Event Scale (INES).⁵⁰⁵ *Ecocide* is the term used by some to

⁵⁰¹ Nuclear Regulatory Comm'n Special Inquiry Group, Three Mile Island: A Report To The Commissioners And To The Public, pt. 2, at 309 (1979)

⁵⁰² Brice Smith, *Insurmountable Risks* 116 (2006).

⁵⁰³ Ibid. A brief review of the accident at Three Mile Island.

⁵⁰⁴ Ibid. A brief review of the accident at Three Mile Island.

⁵⁰⁵ See, Analysis: A Month on, Japan Nuclear Crisis Still Scarring, Int'l Bus. Times (Apr. 9, 2011), <http://in.ibtimes.com/articles/132391/20110409/japan-nuclear-crisis-radiation.htm>; Richard

describe Chernobyl, the most tragic and enduring environmental problem of the Ukraine.⁵⁰⁶ On the Ukraine-Belarus border, four nuclear reactors were running with a capacity of one gigawatt. One of the reactors in the Chernobyl plant malfunctioned due to operative error (the plant was operated by inadequately trained personnel), which resulted in the emission of radioactive materials. The Chernobyl nuclear accident occurred at 01:21 a.m. on April 26, 1986. Not until forty-eight hours after the incidental malfunction did authorities in Moscow admit the accident had occurred. Former Soviet President Mikhail Gorbachev's first public address about Chernobyl did not occur until eighteen days later. The radioactive fallout, '30 to 40 times the radioactivity of the atomic bombs dropped on Hiroshima and Nagasaki,'⁵⁰⁷ landed primarily on agricultural land. However, the V. I. Lenin Chernobyl Nuclear Power Station is only seventy-two miles north of Kiev, the capital of Ukraine.

While Soviet officials claimed that only thirty-two people died because of the disaster, the Ukrainian government in 1992 officially estimated that between 6000 and 8000 people died as a direct result of the meltdown of the Chernobyl nuclear reactor with Scale 7 on INES.⁵⁰⁸ Unofficial estimates of potential deaths run as high as 10,000, which would make it the worst industrial disaster in the world. While 5800 children and 7000 adults suffered from irradiation of the thyroid gland in 1986, more than 2.5 million people have been affected by the blast, with increased deaths from cancer and a five to tenfold rise in many diseases.⁵⁰⁹ Today, some of the children who marched through the streets of Kiev in the May Day Parade only five days after the disaster are dying of leukaemia, and others are suffering from thyroid and cancer-related illnesses.

In the thirty-kilometre zone around the reactor, 116,000 people were evacuated. Several million people live in areas where radiation may exceed official limits. More than four million live in areas which are generally clean but contain 'hot spots', where radiation

Shears, Fires Still Raging at Stricken Fukushima Nuclear Reactor One Month After It Was Destroyed by Tsunami, Daily Mail (Apr. 12, 2011), <http://www.dailymail.co.uk/news/article-1375981/Japan-nuclear-crisis-Radiation-bad-Chernobyl-level-7-reached-2nd-time-history.html>. Last accessed on 2 June 2013

⁵⁰⁶ Roman Solchanyk, *Ukraine: From Chernobyl to Sovereignty*, REP. ON U.S.S.R., Aug. 2, 1991, at 21, 21.

⁵⁰⁷ Library of Congress, revelations from the Russian archives 13 (undated) (catalogue of an exhibit at the Library of Congress, June 17- July 16, 1992).

⁵⁰⁸ Chrystia Freeland, *Chernobyl Death Toll Put as High as 8,000*, FIN. TIMES, Apr. 24, 1992, at 2.

⁵⁰⁹ Stephen Nisbet, (1992). *Ukraine Appeals to West Not to Forget Chernobyl*, Reuter Libr. Rep., Feb. 20, 1992.

can be up to twenty times the normal background radiation. Chernobyl shook the confidence of the people in science's ability to conquer the limits of nature.⁵¹⁰ Former Minister of Environmental Protection Yuri Shcherbak, explains 'that under the debris of the fourth unit was buried the ruinous doctrine of developing atomic energy in our country based on the monopoly of one group of scholars, one department, on the forced and secret imposition of the construction of atomic electric power stations without taking into account the population's mood and the decisions of local soviets, without thorough environmental analysis and assessment of possible consequences ...a crisis of faith in atomic technocrats is at hand'.⁵¹¹

Delay in announcing the Chernobyl accident caused the international community to realise that countries are obliged to immediately notify and warn neighbouring countries and even other countries that a nuclear accident or incident had occurred. As a result of the USSR's failure to provide immediate notification about the Chernobyl accident, the two principles of early notification and assistance were codified in the 1986 Convention on Early Notification of a Nuclear Accident and the 1986 Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, which were adopted under the auspices of the IAEA.⁵¹² These two Conventions were adopted because practical application of the international customary norms regarding the issues of notification was not clear.⁵¹³ The international community realised the need to strengthen and improve the legal regime of international law regarding nuclear energy to control trans-boundary environmental damage and to prevent and reduce consequences of nuclear accidents.⁵¹⁴ These obligations of notification and assistance in case of a nuclear accident have become clearer in their application, through the detailed content of these codified Conventions.⁵¹⁵

⁵¹⁰Contra Charles E. Ziegler, (1987). *The Bear's View: Soviet Environmentalism*, TECH. REV., Apr. 1987, at 45, 51.

⁵¹¹ Ibid Contra Charles E. Ziegler, (1987).

⁵¹²The two Conventions were adopted at the IAEA Headquarters in Vienna on September 26, 1986. See *Convention on Early Notification 1986*, *supra* note 302; Int'l Atomic Energy Agency, *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency*, IAEA Doc. INFCIRC/336 (Nov. 18, 1986). [Online]. Available at: <http://www.iaea.org/Publications/Documents/Infircs/Others/infirc336.shtml> Last assessed on 13/04/2013.

⁵¹³Catherin Redgwell, *International Regulation of Energy Activities*, in *Energy Law in Europe*, National, EU and International Law and Institutions 13, 76 (Marha M. Roggenkamp et al., eds. 2001)

⁵¹⁴Adede, A. O. (1987). *The IAEA Notification and Assistance Conventions in Case Of A Nuclear Accident*.

⁵¹⁵Alan Boyle, (1989). *Nuclear Energy and International Law: An Environmental Perspective*, 60 BRITISH Y. B. INT'L L. 281.

The radioactive materials emissions were first noticed in Sweden after the accident⁵¹⁶. Within seven days of the accident, innumerable labourers had died and the radioactive emissions led to the injury of several hundreds of people. Many were detected with thyroid cancer. The Chernobyl accident resulted in social, economic and psychological instability. The emission affected almost the whole of the northern hemisphere and presently, there are still places where agriculture is prohibited since the radiation effect is still active in such areas.⁵¹⁷ This suggests the extent to which radioactive materials spread and the impact they can create.

The issue arose that almost the whole of Europe was affected by the incident but none of the victims from other countries were compensated for their injury⁵¹⁸. Another issue was that at the time of the incident, Russia had not ratified any of the Conventions relating to nuclear power projects and emissions⁵¹⁹. So, no country could make any claim(s) against Russia. Most of these affected countries incurred huge losses in attempts to save their citizens from the effects of the emissions. This is highly significant with regard to liability and compensation. This suggests that it is important for countries likely to be impacted negatively by the nuclear projects in another country, to ratify relevant legislations in order to help them institute claim actions if the need arises.

The results of the Chernobyl accident led the international community instigating urgent measures, necessary to minimise the consequences of nuclear accidents in the future⁵²⁰. Therefore, the duty falls upon IAEA, which controls global nuclear undertakings, to provide these measures at the international level. At the UAE (national level), it is the responsibility of FANR to provide such measures. The limitations of the existing system in dealing with the consequences of nuclear accident were felt. A global method of ensuring safety of nuclear power projects was found to be of priority. The safety of nuclear power plants was known to be achieved through co-operation between

⁵¹⁶ OECD Nuclear Energy Agency, op.cit.

⁵¹⁷ UN Scientific Committee on the Effects of Atomic Radiation, 'SCEAR's Assessments of the Radiation Effects of the Chernobyl Accident', (2011). Available at: <http://www.unscear.org/unscear/en/chernobyl.html#Summary> Accessed 2 June 2013

⁵¹⁸ Günther Handl, 'Transboundary Nuclear Accidents: The Post-Chernobyl Multilateral Legislative Agenda', (1988), 15 Ecology L. Q., 203. Available at: <http://heinonline.org/HOL/LandingPage?collection=journals&handle=hein.journals/eclawq15&div=15&id=&page=> last accessed on 4 June 2013

⁵¹⁹ OECD, op.cit.

⁵²⁰ Patricia Birnie, Alan Boyle and Catherine Redgwell, (2009). *International Law and The Environment*, 3rd Ed., OUP, p 488.

neighbouring countries and a more robust method of developing a structure of liabilities on nuclear accident was also required.⁵²¹

4.6.4 The 2011 Fukushima Accident

On 11th March 2011, an extremely powerful earthquake struck Japan, along with a devastating tsunami which descended upon Iwate and Miyagi Prefectures.⁵²² Because of this tsunami and earthquake, the area's nuclear facilities were severely damaged.⁵²³ The Fukushima Daiichi Nuclear Power Plant Complex was the most famous and most serious casualty of the crisis. This plant was located in the Okuma and Futaba in Fukushima Prefecture towns.⁵²⁴ Thousands of residents had to be evacuated and widespread power shortages occurred after the disaster.⁵²⁵ The Fukushima incident was caused by natural disaster and was not due to operator fault and/or liability. The UAE is not situated in a natural disaster volatile environment but is close to Iran (one of the GCC countries), which is prone to earthquakes. Therefore, the country's nuclear programme may not be affected by natural disaster(s). But this is not to say that measures should not be taken in case of any occurrence.

Since the Chernobyl plant in 1986, the Fukushima incident has been regarded as the largest and most severe incident, reaching Level 7 on the INES scale. The reactor's connection to the power grid was broken after the tsunami hit the plant and even after the remaining reactors shut down automatically after the earthquake, the emergency generators needed to be used for electronic control and cooling of systems that had no power. Hence, there was overheating of the reactors and large amounts of radiation

⁵²¹Ibid.

⁵²²See New USGS Number Puts Japan Quake at 4th Largest, CBSNews (Mar. 14, 2011), <http://www.cbsnews.com/stories/2011/03/14/501364/main20043126.shtml>. Last accessed on 4 June 2013

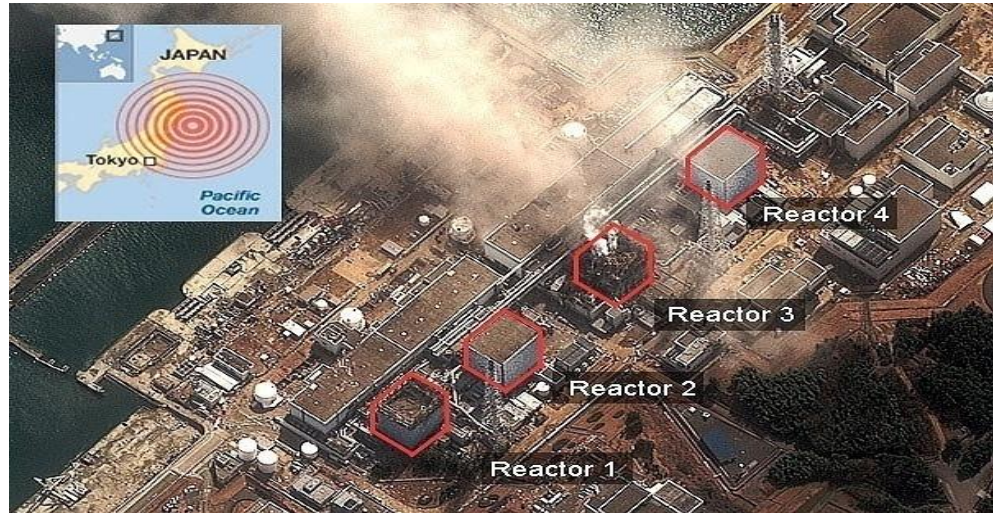
⁵²³3 Nuclear Reactors Melted Down After Quake, Japan Confirms, CNN World (June 6, 2011), http://articles.cnn.com/2011-06-06/world/japan.nuclear.meltdown_1_nuclear-reactors_-fuel-rods-tokyo-electric-power?s=PM:WORLD Last accessed on 2 June 2013

⁵²⁴Fukushima Accident 2011, World Nuclear Ass'n, <http://www.world-nuclear.org/info/fukushima-accident-inf129.html> Eliza Strickland, Explainer: What Went Wrong in Japan's Nuclear Reactors, IEEE Spectrum (March 16, 2011), <http://spectrum.ieee.org/tech-talk/energy/nuclear/explainer-what-went-wrong-in-japans-nuclear-reactors>. Last accessed on 4 June 2013

⁵²⁵Japan Quake: Radiation Rises at Fukushima Nuclear Plant, BBC News (Mar. 15, 2011), <http://www.bbc.co.uk/news/world-12740843>; Japan's PM Urges People to Clear 20-km Zone Around Fukushima NPP (Update 1), RiaNovosti (Mar. 15, 2011), <http://en.rian.ru/world/20110315/163008635.html>. Last accessed on 2 June 2013

escaped out into the atmosphere, causing hydrogen explosions within the plant on subsequent days⁵²⁶ (see Diagram 9 below).

Diagram 9: Fukushima nuclear incident



Source: Freepatroit.org, 2013⁵²⁷

To save the reactors from getting damaged by over-heating, the government allowed the use of seawater by the emergency response team.⁵²⁸ However, this step was more ineffective than helpful, as the water level in the fuel rod pools kept on falling (due to tides).⁵²⁹ The adjoining areas of up to 12 miles' distance were cleared out immediately and electrical power was supplied to a few reactors, to facilitate automatic cooling.⁵³⁰

The Japanese Government consistently rejected the global help calls during the crisis and initially marked the incident as a Level 4 (incident with local consequences) on the INES instead of the original Level 7 (major accident with major impact on the people and the

⁵²⁶3 Nuclear Reactors Melted Down After Quake, Japan Confirms, supra note 5; 'Melt-Through' at Fukushima? Govt Report to IAEA Suggests Situation Worse than Meltdown, Yomiuri Shimbun (June 8, 2011), <http://www.yomiuri.co.jp/dy/national/T110607005367.htm> Last accessed on 4 June 2013

⁵²⁷Freepatroit.org (2013). Radiation Threat New Fukushima Nuclear Plants. [Online]: Available: <http://freepatroit.org/2013/08/16/radiation-threat-new-fukushima-disaster-recovery-critical/> Accessed on 17/08/2014.

⁵²⁸Thomas H. Maugh II, Japan Quake: 2nd Reactor Cooled with Seawater to Avert Meltdown, L. A. Times (March 13, 2011), <http://articles.latimes.com/2011/mar/13/science/la-sci-japan-quake-reactor-20110313>. Last accessed on 4 June 2013.

⁵²⁹Nuclear Emergency Response Headquarters, Gov't of Japan, Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety-The Accident at TEPCO's Fukushima Nuclear Power Stations 9 (June 2011), available at <http://www.ornl.gov/sci/nsed/outreach/presentation/2011/Beatty.pdf>. Last accessed on 4 June 2013.

⁵³⁰KosakuNarioka, Japan Nuclear Fight May Have Turned Corner, Wall St. J. (March 20, 2011), <http://online.wsj.com/article/SB10001424052748704021504576210251376606080.html>. Last accessed on 3 June 2013.

environment). The researcher's view is that the reason for the constant rejection by the Japanese government was to avoid enormous blame arising from the incident and this is not morally acceptable.

The Japanese government has been condemned by numerous groups and communities around the world. Many of the greatest criticisms related to the administration's poor correspondence, administrative disappointments and reluctance to concede the full scale and extremity of the fiasco. Many evacuees still cannot return home, examinations of the Tokyo Electric Power Company (TEPCO) have started and bans on sustenance developed in the zone have been measured. On 16 December 2011, the government proclaimed that the plant is steady, yet the appraisal is that it will take decades to purify the encompassing area and decommission the plant altogether.⁵³¹

In the twentieth century, a growth in favour of atomic power has been witnessed, with nations like France, the US and Japan fabricating more plants, making new outlines for the reactor, and helping developing economies like China in the advancement of their own atomic power systems. In this modern atomic era, catastrophes like Chernobyl appear to have been forgotten, but the author recognises that the international community has learned lessons from past incidents. It is obvious that UAE will also benefit from these experiences and consider a stronger plan for its nuclear programme. Many in Japan and from around the globe have added further thought to the global atomic administrative authority after the latest catastrophe at Japan's Fukushima Daiichi plant.

The IAEA administered the production of five Conventions, which drew up the global principles for atomic protection and risks collaboration in case should there be a disaster and an early warning framework between countries.⁵³² The IAEA has additionally laid down atomic security standards and guidelines however, they are not mandatory for member states. Accordingly, a few states have neglected to execute these regulations and

⁵³¹ Masami Ito, Official Probe Begins into Nuclear Disaster, Japan Times (June 8, 2011), <http://www.japantimes.co.jp/text/nn20110608a1.html>; The Nat'l Diet of Japan, The Official Report of the Fukushima Nuclear Accident Independent Investigation Commission: Executive Summary 10-11 (2012), available at http://www.nirs.org/fukushima/naiic_report.pdf. Last accessed on 4 June 2013.

⁵³² Karen McMillan, Strengthening the International Legal Framework for Nuclear Energy, *13 Geo. Int'l Env'tl. L. Rev.* 983, 990 (2001). Last accessed on 4 June 2013.

have overlooked maintaining their own guidelines.⁵³³ The author posits that although they are not mandatory, they contain provisions that could ensure viable nuclear projects, if adequately followed. Member States are liable for making their own legislations to guide their nuclear projects, which again, must be in line with those of IAEA and the UN. The UAE has in this way produced many laws to augment its nuclear programme.

Japan has constantly been subjected to worldwide criticism for neglecting the protection of its atomic administration. Not only does the administration stay oblivious to the disorder in the plants, but the enterprises also hide the information regarding the conditions in them. These disorders of the national framework have brought about harm to the protection and prosperity of the public, national inspections and anti-atomic exhibits. The catastrophe at Fukushima shed light on the failures of the attempts made by national administration and the current global atomic safety regime, to secure the prosperity of the general population during an atomic occurrence. The author suggests that countries should not solely depend upon their own administration whilst ignoring those of the international community, but that a combination of both could be most of most help and benefit.

The Fukushima nuclear accident happened amidst discouraging public support for the growth of nuclear power plants. However, this discouragement did not change the emphasis on the need for such a method of power production. The balance between ‘necessity, approval and legitimacy’ was nearly collapsing during this time.⁵³⁴ Like the Chernobyl incident, the Fukushima accident also made it necessary to revamp the safety and security measures that were in existence until then. Does this suggest that international regimes are only subject to amendment after an incident has occurred? Both international and national regimes should be routinely vetted to suit contemporary changes and this could be a viable lesson for the UAE.

The issue of liability was another major reason why many debates were held after the Fukushima accident. Like the Chernobyl accident, Japan was also not party to any of the Conventions relating to nuclear safety and accidents. But there was a difference in the

⁵³³Karen McMillan, Strengthening the International Legal Framework for Nuclear Energy, *13 Geo. Int'l Env'tl. L. Rev.* 983, 990 (2001). Last accessed on 3 June 2013.

⁵³⁴Vasquez-Maignon, Ximena (2011). Fukushima: Liability and Compensation. *NEA News*, No. 29.2 pp 9-11.

circumstances since Japan had a strong domestic system of law that dealt with the issue. The Fukushima incident was different from that of Chernobyl, since the effect of the accident did not breach Japan's borders. The legal system in Japan recognised liability per international instruments. Therefore, the operator of the nuclear power plant in Fukushima took both responsibility and liability for the incident⁵³⁵.

It is interesting to note that the Act of Compensation for Nuclear Damage of Japan provides for the exoneration from third party liability when there is a 'grave natural disaster' that caused the injury. In the case of Fukushima, there was an earthquake coupled with a tsunami and the nuclear accident. Although it was explained by many of the parties in Japan, that the operator of the nuclear reactor in Fukushima Daichi, TEPCO, can be exonerated from third party liabilities, since this was damage due to a grave natural disaster, the Japanese ruling party decided that as Japan is more vulnerable to earthquakes than any other country, an earthquake of this nature cannot automatically be accepted as being serious enough as to exempt TEPCO from its liability. TEPCO agreed with the government and accepted liability since their corporate policy was to take voluntary responsibility for the damage caused by the accident⁵³⁶. Therefore, this suggests that based on experience, TEPCO is already aware of its responsibilities in case of nuclear disaster and will bring this to bear in the UAE, having been selected as the operator there.

4.6.5 Causes and impacts of nuclear incidents and lessons learned from them

Nuclear incidents have different causes and impacts. These are further discussed, as well as lessons that the UAE could learn from them. The impacts of nuclear accidents include health effects, evacuation of polluted areas and impacts on energy strategies and nuclear safety work in different nations.⁵³⁷ Lars Högberg (2013) further maintains that important purposes for nuclear reactor safety work must be to prevent disasters from developing into harsh core damage, whether they are set off by very improbable normal or man-made actions, and, considering that catastrophes with severe core damage may however take

⁵³⁵ Ibid Vasquez-Maignon, Ximena (2011).

⁵³⁶ Ibid. Vasquez-Maignon, Ximena (2011).

⁵³⁷ Lars Högberg (2013). Root Causes and Impacts of Severe Accidents At large Nuclear Power Plants. [Online]. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3606704/> Accessed on 17-06-2016.

place; and to avoid massive and sustained ground defect by preventing discharges of radioactive nuclides such as cesium to smaller than about 100 TBq.⁵³⁸

The lessons learned from past nuclear incidents should have wider application to all nuclear related organisations. The intent of this analysis is not to discover error through the conducts engaged, but to identify ways to lessen the possibility for such events and to be primed to take action if faced with similar situations in the future. Therefore, to realise the objectives of the reactor, the significance of upholding high universal principles of safety management and safety traditions cannot be accentuated sufficiently.⁵³⁹

4.6.5.1 Prepare for the Unexpected

During occasional surveys, the potential for conditions ought to be guaranteed. This could totally decrease the security parameters or surpass the present ideas, or a formal, convenient and complete evaluation of the potential for generous outcomes to be arranged.⁵⁴⁰ To completely comprehend the atomic security implications and objective, protective survey with a review of each section should be arranged. On the off chance that the outcomes could involve usual errors or malfunctions of security systems, safety measures should be taken as soon as possible which include early notification and contingency planning.

4.6.5.2 Operational response

4.6.5.2.1 Core cooling

Adequate knowledge about core cooling status must be kept as the prime focus of attention.⁵⁴¹ The authorities concerned in the UAE should take necessary steps to maintain the cooling systems in good condition. In case of any doubts regarding the working of systems, required actions must be taken to resolve the issue.

⁵³⁸ See Lars Högberg (2013).

⁵³⁹ Ibid

⁵⁴⁰ Mondal, Puja (2015). Nuclear Accidents and Holocaust: Definition, Causes and Consequences of Accidents [Online]. Available at: <http://www.yourarticlelibrary.com/essay/nuclear-accidents-and-holocaust-definition-causes-and-consequences-of-accidents/30193/> Accessed on 23/01/2015.

⁵⁴¹ See Mondal, Puja (2015).

If an incident takes place, the control room and the Emergency Response Control (ERC) staff must be communicated clearly so that rescue actions can be planned accordingly. Moreover, the authorities must provide comprehensive guidance to their personnel beforehand, in order to ensure effective execution of rescue plans.⁵⁴² The researcher suggests that training of staff in the UAE should be ensured in order to implement a successful nuclear programme.

4.6.5.2.2 Containment venting

The recovery plans devised for emergency or accidental situations must provide complete assistance for facilitating ejection of containment to uphold integrity, eliminate hydrogen and ensure injection with low-pressure systems⁵⁴³.

The rescue plans must be applicable in the areas with vent valves, under special conditions like during power losses, raised levels of radiation and high temperatures⁵⁴⁴. The researcher argues that based on liability, the effectiveness of the above measures is on sound operational management which should do with expertise. This will be further discussed in the next Chapter Five.

4.6.5.2.3 Accident response

Nuclear operators should arrange for the emergency response setups beforehand to deal with any kind of accidental situations and to lessen the damages to the systems. These arrangements must include fully trained and efficient staff, necessary equipment and long term strategies able to be deal with any kinds of accidents, including beyond-design-basis incidents as well.⁵⁴⁵

There must be adequate facilitations provided to involve corporate and industrial sector aid during the times of damage to nuclear operating infrastructures. To minimise risk in

⁵⁴² Ibid

⁵⁴³ Ibid

⁵⁴⁴ See Mondal, Puja (2015).

⁵⁴⁵ Lam, Peter (2013). Severe Nuclear Accidents: Causes and Consequences. Presentation at the CEC 2013 IEPR WORKSHOP June 19, 2013. [Online]. Available at: http://www.energy.ca.gov/2013_energy_policy/documents/2013-0619_workshop/presentations/11_Lam_CEC_IEPR_Conference_2013.pdf Accessed on 16/01/2015.

nuclear energy development, the operator or the authority concerned must devise plans to ensure that zero tolerance is put into practice. In a situation, whereby an incident has occurred, acceptable plans must be in place to contain general reporting and emergencies. There is great benefit in a quick response to nuclear accidents, as this would help to reduce likelihood of harm the incident poses. The researcher concludes that the practical steps to be adopted here also fall under the morally acceptable duties expected of the nuclear plants' operator, as discussed in Chapter Two of the thesis.

4.6.5.3 Staffing

In case of any kind of accidental incident, there must be clear and comprehensive strategies (emergency plans) developed that can serve for a longer period of time in the very initial stages of the accident. It must also be ensured these strategies are communicated to nuclear operating personnel, internal and external emergency response teams and other operating staff.⁵⁴⁶ The UAE is taking this seriously, to avoid negligence.

4.6.5.4 Human limitations

It must be ensured that the emergency response strategies and trainings may also help the personnel to deal with the emotional dilemma that comes because of any catastrophe. Emotional strife can affect an individual's decision making and receptive abilities to cope with accidental situations.⁵⁴⁷ These should form part of staff training and monitoring processes.

4.6.5.5 Emergency preparedness

Various levels of monitoring methods, for keeping nuclear plants' functioning under critical examination, must be provided. The emergency response personnel must be provided with regular trainings so that they might be fully skilled to use monitoring tools and methods.⁵⁴⁸ This should be regular practice drills.

⁵⁴⁶ See Lam, Peter (2013).

⁵⁴⁷ See Mondal, Puja (2015).

⁵⁴⁸ Ibid

There must be made complete on-site and off-site arrangements to coordinate emergency response activities as well as ensure their functionality application in case of any emergency.

Experts of every relevant sector who might help in dealing with emergency situations and must also be able to operate accident response tools must be kept available. This can be achieved by either making contracts with experts or by providing professional and high quality training to internal emergency response staff to hold this position.

4.6.5.6 Design and equipment

The emergency response equipment must be able to function for a longer period even in shortage of alternation current (AC), direct current (DC) and heat energy. It must be designed and maintained as such, that it may be readily available and functional at critical and emergency situations.⁵⁴⁹

The nuclear plants must also be modified in order that they may perform basic functions safely during multi-unit emergencies which may lead to long term shortage or loss of AC power, DC power and the heat sink.

4.6.5.7 Procedures

The organisations supervising the nuclear power plants must develop adequate strategies and corresponding implementation plans to deal with any kind of accident or emergency situation with the help of utilising communication tools and methods to exchange information with the reactor vendors.⁵⁵⁰ Authorities must not divert from these plans and procedures unless they have thoroughly assessed the standard technical and safety parameters and have also devised alternative strategies to replace the earlier ones.

Natural disasters or internal accidents may affect the operations and the plant personnel during and after the incident. This may hinder the responding actions to the situation.

⁵⁴⁹ See See Lam, Peter (2013).

⁵⁵⁰ See Mondal, Puja (2015).

Therefore, while devising emergency plans and strategies such hindrances and barriers must be acknowledged.

4.6.5.8 Knowledge and skills

Both internal and external emergency response personnel must have complete knowledge and understanding of methods and equipment to be used to counter accident situations. They must be trained effectively so that they might be able to perform effectively in actual disaster conditions.⁵⁵¹

4.6.5.9 Operating experience

The personnel must be able to perform and employ their learning acquired during training actively and efficiently. They must also be aware of the international standards and latest trends about their field.

When exposed to international events and response mechanisms employed to them, the personnel tend to form their perceptions within that perspective and expect to counter similar situations. As such they completely overlook the actual causes of the accident. Therefore, timely actions must be taken to enable the personnel to develop wide-ranged perceptions and strengthen their response abilities.⁵⁵²

4.6.5.10 Nuclear Safety culture

The behavioural patterns observed before and during the Fukushima Daiichi incident proved that nuclear safety culture is yet to be strengthened and developed. The nuclear operating organisations must review their practices and work on the areas which require development, considering studies conducted upon this incident. They must take the necessary steps to spread awareness of safety culture, principles and qualities.⁵⁵³ Every staff member of a nuclear plant must be aware of the safety procedures in place for said plant and ensure that routine trainings and developments are carried out.

⁵⁵¹ Ibid

⁵⁵² See Lam, Peter (2013).

⁵⁵³ See Mondal, Puja (2015).

4.6.6 Lessons for the UAE

In 2011, the world witnessed another episode of a nuclear accident following Chernobyl. This was Fukushima I nuclear Power Plant, due to radioactive emission. Radiation was even expected in Tokyo's tap water because of the incident⁵⁵⁴. The same situation occurred in Chernobyl, after which the international community worked hard for safer nuclear power generation. These two incidents have reduced public support for nuclear power plants in various countries. Since the legislations relating to civil liability and nuclear accidents were not effective in providing relief to the victims and to simultaneously encourage new investment in the area, there was need for a system overhaul. The researcher admits that the UAE has learned enormously from the four outstanding nuclear incidents discussed above. The country seriously reflects upon the various lapses which led to those accidents, as it pursues its own nuclear development. The country also benefits from the changes that have taken place in the international laws following the incidents.

Since a balance is required between the public's interests and commercial development, two Conventions were entered by the UAE, namely: the Paris Convention on Third Party Liability in the Field of Nuclear Energy (see Appendix 9) and the Vienna Convention on Civil Liability for Nuclear Damage (see Appendix 8)⁵⁵⁵. After the adoption of these two Conventions, the Chernobyl accident took place which had significant effects on both man and environment. The UAE was already on board with these Conventions.

There were several shortcomings to these Conventions, which became evident after the Chernobyl incident in 1986. First, the restriction in the claim was too small for the victims to be substantially compensated⁵⁵⁶. Secondly, not all countries were signed up to the Conventions and finally, within them, all possible injuries that could be potentially caused

⁵⁵⁴ Elaine Kurtenbach and Shino Yuasa, *Anxiety in Tokyo over radiation in tap water*, (The Associated Press, Tokyo, 2011) also available at: <http://www.businessweek.com/ap/financialnews/D9M59 PR00.htm> Accessed on 03-06-2013.

⁵⁵⁵ The Paris Convention on Third Party Liability in the Field of Nuclear Energy entered into force in 1968. For the text of convention visit: http://www.oecdnea.org/law/nlparis_conv.html Accessed on 02-06-2013; The Vienna Convention on Civil Liability for Nuclear Damage entered into force in 1977. For the text of convention Visit: <http://www.iaea.org/Publications/Documents/Infcircs/1996/inf500.shtml> Accessed on 02-06-2013.

⁵⁵⁶ OECD Nuclear Energy Agency, *Liability and Compensation for Nuclear Damage*, (Paris-1994), 12.

by nuclear accident(s) were not sufficiently covered⁵⁵⁷. The limitation period of the claims was also too short a time for the injured to make claims, especially since the effects of nuclear accidents become prevalent after many years and generations. The complexity in the prescribed method for claiming the damages also acted against the injured⁵⁵⁸.

It was due to these shortcomings, that the Joint Protocol relating to the application of the Vienna Convention, The Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage, the Convention on Supplementary Compensation for Nuclear Damage, 1997 and finally, the Paris Protocols to amend the Paris Convention and the Brussels Supplementary Convention were entered into⁵⁵⁹. Once again, the UAE has adopted all the instruments.

From the Chernobyl and Fukushima accidents, it can be deduced that the absence of ratification of the international conventions dealing with nuclear accidents and emissions has proved to be detrimental at various stages. When it comes to paying damages to the injured in a nuclear accident, it is much easier if there are international teams and economic measures that can help the country(ies) in which such an accident takes place. In the case of Fukushima, there was no ratification of international instruments relating to nuclear accidents and this made it difficult for Japan to pay back damages to the accident victims, since only the national team and financial security measures were in existence - external, international aid was lacking⁵⁶⁰. The UAE has ratified international instruments relating to nuclear accidents. The country is aware of what is required when a nuclear incident occurs, as well as the ways in which to deal with claims.

⁵⁵⁷Ibid.

⁵⁵⁸Ibid.

⁵⁵⁹For the text of protocol, visit: <http://www.iaea.org/Publications/Documents/Conventions/protamend.html> Accessed on 2 April 2011;

For the text of convention, visit: <http://www.iaea.org/Publications/Documents/Infcircs/1998/infcirc567.pdf> Accessed on 2 April 2011;

2004 Paris Protocol to Amend the Paris Convention visit: http://www.oecdnea.org/law/paris_convention.pdf Accessed on 02-06-2013;

2004 Paris Protocol to Amend Brussels Supplementary Convention visit: <http://www.oecdnea.org/law/Unofficial%20consolidated%20Brussels%20Supplementary%20Convention.pdf> Accessed on 02-06-2013.

For Joint Protocol visit: <http://www.iaea.org/Publications/Documents/Infcircs/Others/inf402.shtml> Accessed on 02-06-2013.

⁵⁶⁰ Gabor Kecskes, 'The Nuclear Liability Issue after Fukushima - The Role of International Law in Liability Theory', available at http://www.burges-salmon.com/INLA_2012/10148.pdf Last accessed on 10th June, 2013.

Japan and Ukraine did not have the necessary support from the international community since they were not party to any of the international instruments, hence, the need for UAE to adopt all relevant instruments. Recently, there has been a three-tier system of compensation entered by countries, through the Paris-Brussels protocol. Unfortunately, since Japan was not party to any of these instruments, such mechanisms were not available to Japan. Despite Japan having a strong domestic legal system which enumerated the procedure for compensation payments, the accident in 2011 showed their system's inability to deal with the situation when the amount of secured payment that could be raised by the operator was not enough to compensate those injured in the accident. The Compensation Act of Japan provided for the government's payment of the balance amount. In this situation, a corporation was established to pay the rest of the amount to the victims. However, the operator is bound to repay the amount to the corporation by resorting to methods of cost reduction⁵⁶¹.

However, it is an astonishing fact Japan failed to ratify the international instruments relating to nuclear reactors and emissions, particularly when the country is a forerunner for nuclear power generation projects and especially as it is more vulnerable to natural disasters than any other country. Hence the risk factor was (still is) exceptionally high in Japan for this reason⁵⁶². This emphasises the fact that all nuclear energy producing countries should ratify international Conventions on nuclear energy. The UAE would like to avoid the above scenario so has ratified international Conventions.

4.6.7 Possible scenarios showing how the liability system may work

Some possible scenarios are postulated below to provide examples of how the liability system may work in practice. Some of the countries in Asia do not ratify Vienna and Joint Conventions on Civil Liability for Nuclear Damage and this can cause conflict between Member and Non-Member States. Therefore, this section shows how the UAE can learn from these incidents, and has the necessary procedures and plans in place to manage any eventuality. Here are some hypothetical scenarios which highlight the approved approaches with nuclear damage.

⁵⁶¹Vasquez-Maignon et al, op.cit.

⁵⁶²Ibid.

- a. A shipment bearing a UK flag carries a nuclear product sent from a Korean operator to UAE. In the middle of the sea a nuclear accident takes place, emitting high range radiations in the surroundings. The incident adversely affected the fishing and tourist industry along with damaging Japanese, Chinese and Philippines fishing fleets. Though there is not solid proof that the accident has contaminated tuna or not, the fish caught from within the affected area is prohibited from being sold. Also, no traces of radioactivity on surrounding beaches have been found, but nonetheless, tourists have been restricted from visiting the area.⁵⁶³.

In this case, the UK and South Korea are liable to Paris and Brussels Supplementary Convention, while China and Japan are exempt from any such condition because they are not parties. The fishing operators will be provided with the choice of either to begin a law suit in the UK, UAE, or their own respective countries. If they choose to sue in their own country, they will ensure to implement the decision at any cost either through multilateral agreement or bilateral reciprocal judgement enforcement treaty. In such a situation, there are very limited chances of success, as the damage is claimed to be purely economic because the contamination of fish might not be proved with solid evidence.

It is open to discussion whether the fishing businesses in any of those countries make progress with their claims in terms of possibilities, if States link any of the accountability Conventions. As China and the UK are not a part of the Joint Protocol, the only option is to join the Paris Convention. Because the Paris Convention is not effective, the only option the countries are left with is the Vienna Convention which the UAE is signatory to. UAE is also ratifying the Joint Protocol for the amendment of Paris and Vienna Conventions. There are reduced chances for improvement, as the statement is not for loss to possessions caused by a nuclear occurrence including nuclear materials in the sequence of transport. If there was an improvement, accusations would be restricted to the £140 million on condition under the Nuclear Installations Act 1965, outside which the Paris/Brussels system influences.

⁵⁶³ US Department of States-Diplomacy in Action. Convention on Supplemental Compensation for Nuclear Damage: Article by Article Analysis. Available at: <http://www.state.gov/t/isn/trty/5951.htm> Last Accessed on 4 June 2013.

- b. A ship carrying nuclear material to Dubai ports via the coast of India is hit by an aircraft manned by terrorists. The incident resulted in emitting radioactive radiations into the Indian Ocean, Southern India and Sri Lanka. The incident caused economic loss to the tune of hundreds of millions, even billions of dollars. Many people died in the incident while thousands began to suffer from radiation poisoning.⁵⁶⁴

India is not an associated partner of the Paris and Brussels Convention; it is the same situation for Sri Lanka. Therefore, applicants in those states would have to forward their claims and demands in UAE or South Korea. They would be dependent on the claims made by the worker or its guarantors that the exclusion in Article 9 of the 1960 Paris Convention, being ‘armed dispute, conflicts, aggression, civil war, and insurgency’ was included. They have an additional option of putting up their statements or claims in India or Sri Lanka, in courts of their own state. If they did so they would be exempted from all kinds of liabilities. Here, the operator shall not be liable for damage caused by a nuclear incident directly and therefore there would be dispute between territorial countries whether Members or Non-Members. The researcher suggests that in this scenario, the UAE should undertake bilateral agreements should this happen.

- c. The UAE nuclear power plant encountered an accident which caused the release of significant amounts of radiation in Saudi Arabia, Oman and Yemen. This incident adversely affected the date and poultry farmers.⁵⁶⁵

The UAE is a member of the Vienna Convention on Civil Liability for Nuclear Damage, BSC and Paris Conventions, while Oman, Yemen and Saudi Arabia are not. In this case, the compensation would be made in terms of a limited definition and only damages or losses of life, health or property would be addressed. The farmers would be required to provide the cost of the damage caused to their property if they want to receive the compensation. The author notes that this will place burden of proof on the farmers,

⁵⁶⁴ See US Department of States-Diplomacy in Action. Convention on Supplemental Compensation for Nuclear Damage: Article by Article Analysis. Available at: <http://www.state.gov/t/isn/trty/5951.htm> Last Accessed on 4 June 2013.

⁵⁶⁵ See US Department of States-Diplomacy in Action. Convention on Supplemental Compensation for Nuclear Damage: Article by Article Analysis. Available at: <http://www.state.gov/t/isn/trty/5951.htm> Last Accessed on 4 June 2013.

meaning that they would have to seek experts' opinion to be able to do what is required. The author says that other GCC countries will not use the above Conventions for compensation because most of them are not Members. Here the UAE needs a bilateral agreement to avoid any dispute from nuclear incidence or other countries ratify the Conventions.

4.7 Analysis of the nature of criminal and civil liability areas

The effects of nuclear emission are not comparable to other methods of power production. Radioactive materials can ruin a large tract of land that goes beyond the geographical boundaries of a nation. This results in heavy loss of both lives and finances. The IAEA has formulated an action plan which requires the international community to build an international system that deals with the compensation for nuclear damages⁵⁶⁶. The UAE has also formulated action plans to enable coping with compensations for damages.

The liabilities that are in existence regarding the nuclear accidents and emissions are seen in the Paris Convention and the Vienna Convention, along with its protocols. These liabilities are discussed below.

4.7.1 Strict liability

The liability under tort is not restricted and there is no mandatory provision to insure such obligation⁵⁶⁷. The obligation of the operator of a nuclear power project is not according to the usual tort law, which places the burden of proof on the claimant to prove that it is the conduct of the operator which resulted in the said fault. On the other hand, all the legislation in the UAE that deals with nuclear installations, the possible damage caused by it and damages caused by the movement of radioactive materials to and from the installation are covered by the strict liability principle.

⁵⁶⁶Nuclear Safety Review for the year 2012, IAEA, (Austria, 2012).

⁵⁶⁷ Marcus Radetzki, 'Limitation of Third Party Nuclear Liability' (1999), Nuclear Law Bulletin No. 63, 7. Available at: <http://www.oecd-neo.org/law/nlb/NLB-63/radetzki.pdf> Accessed on 2 June 2013.

According to the strict liability principle, it is not necessary for the claimant to show that the operator's action(s) resulted in such injury⁵⁶⁸. The liability regime provides for exceptions in the strict liability rule to the operator so far as the accident or injury is caused by an Act of God or by war or hostilities. In such circumstances, strict liability will not be applicable⁵⁶⁹.

4.7.2 Exclusive liability

Exclusive liability is attributed only to radioactive incidents. This kind of liability is not available for other kinds of torts or activities⁵⁷⁰. Exclusive liability means that the operator of the nuclear power plant is the only individual who is responsible for answering the injured party(ies) claims, even if there are other persons who have played a part in the cause of injury⁵⁷¹. By providing for exclusive liability on the operator of the nuclear incident, the injured is saved of the time to find as to what caused such injury and who is behind such cause. All claims of the injured can be answered by the operator of the power station.

Another reason for making the operator of the power plant responsible is to cut the costs of the suppliers of nuclear raw materials and the technology providers, from taking out insurance policies to fulfil their obligations to the possible victims every time they supply the raw material or the technology. The transporters of radioactive materials are also saved from exclusive liability, since they will not be held liable for the accidents caused during the transit⁵⁷².

While many of the scholars believe exclusive liability is required in the case of nuclear incidents, there are some scholars who opt against it. The reason for such opposition is

⁵⁶⁸ Julia A. Schwartz, 'International Nuclear Third Party Liability Law: The Response to Chernobyl', OECD 2006. Available at: <http://www.oecd-nea.org/law/chernobyl/SCHWARTZ.pdf> Accessed on 2 June 2013.

⁵⁶⁹ Duncan E. J. Currie, (2007). 'Liability of Nuclear Power Incidents: Limitations, Restrictions, and Gaps in the Vienna and Paris Regimes', in Heinz Stockinger, Jon M. Van Dyke, Michael Geistlinger, Sarah K. Fussek and Peter Machart (Eds) *Updating International Nuclear Law*, (Wien-Gra: Intersentia) 75.

⁵⁷⁰ Norbert Pelzer, 'Focus on the Future of Nuclear Liability Law', (1999), 17 (4) *Journal of Energy & Natural Resources Law*, 332. Available at: <http://heinonline.org/HOL/LandingPage?collection=journals&handle=hein.journals/jenr117&div=38&id=&page=> Accessed on 2 June 2013.

⁵⁷¹ Karine Fiore, (2008). 'The Nuclear Limit on the OECD Conventions: An Implicit Subsidy', (Maastricht University), available at: <http://ssrn.com/abstract=1086290> Accessed 2 June 2013.

⁵⁷² Elaine Kurtenbach and Shino Yuasa, op.cit.

that the exclusion of the suppliers and transporters from liability to address the claims of the injured would result in a lack of responsibility on their part⁵⁷³. According to Pelzer, exclusive liability is the edifice on which the whole legal regime relating to nuclear incidents is based. On the other hand, Mehmet SuatKayikci (2011) opines that the providers of raw materials and technology should be made responsible for materials or technology supplied along with the profit⁵⁷⁴.

4.7.3 Restriction in claim amount(s)

The complex liability is unrestricted and the person responsible must pay all the damages caused to the victim. In environmental law, the person liable must pay an unrestricted amount for the claim. However, in cases involving the nuclear field, there is a restriction in the claim amount taking into consideration the fact that a nuclear incident can lead to unimaginable harm to life and property. This would result in fewer numbers of nuclear power plant operators and would discourage the development of nuclear power. To avert such a situation, the legislators have made the claim amount restricted, thus helping the operator(s) to obtain insurance policies for a lesser amount⁵⁷⁵. Notwithstanding the restrictions on the claim amount, it is good that such policies may provide a boost to the industry; on the other hand, it could lead to failure of preventive steps being taken by the operator to avoid the usual risk(s) of nuclear power plants⁵⁷⁶. This could also lead to a situation where the victims are not properly compensated for their injury(ies)⁵⁷⁷.

The Paris Convention and the Vienna Convention increased the restriction levels of compensation payable by the operator and also provided with it, a step by step scheme for paying the compensation, whereby the operator is liable for the first stage of damages, then the country in which the nuclear project is situated will be considered liable for the second step of damages; with the third step being where the parties to the instruments become collectively liable⁵⁷⁸. This step by step procedure of determining the liability

⁵⁷³Birnie, Boyle and Redgwell, op.cit.

⁵⁷⁴Mehmet SuatKayikci, "The International Civil Liability Regime for Nuclear Energy. How Would it Respond to a Chernobyl Disaster of 2011?" Available at: <http://ssrn.com/abstract=2102175>, Last accessed on 11 June 2013.

⁵⁷⁵Duncan Currie, op.cit.

⁵⁷⁶ Marcus Radetzki, 'Limitation of Third Party Nuclear Liability' (1999), Nuclear Law Bulletin No. 63, 7. Available at: <http://www.oecd-neo.org/law/nlb/NLB-63/radetzki.pdf> Accessed 2 June 2013.

⁵⁷⁷ Duncan Currie, op.cit.

⁵⁷⁸ Ibid.

amount ensures a universal liability of all the states concerned to be accountable for making (limited) reparation contributions for the destruction caused by nuclear activity.

4.7.4 Economic safety measures

Since there is exclusive liability for the operators of nuclear plants, they are required to provide economic safety measures which satisfy the highest limit of damages repayable via bank, insurance or State guarantees⁵⁷⁹.

It is also stipulated that the safety measures such as insurance policies and bank guarantees that are given as security for operator liability can only be released for compensation purposes.

4.7.5 Limitation period for claims

The insurers and other financial institutions which guarantee the liability amount of the operators of nuclear power plants believe nuclear accident claims should not be entertained after a decade has passed⁵⁸⁰. According to them, this provides conviction to the legal proceedings.

The Vienna Convention has increased the limitation period for personal injuries from ten to twenty years. This may be a point of concern since money must be reserved for claims even after twenty years, when it relates to personal injuries⁵⁸¹. But this extension of limitation period is reasonable and much expected, since the effects of radiation are known to endure a long period and even through the generations.

4.7.6 Territorial applicability

The Paris and Vienna Conventions' provisions are applied only to those accidents and injuries that happen within the territorial boundaries of countries which are parties to these Conventions. The criteria are that the source of damage as well as the damage itself should

⁵⁷⁹Schwartz, op.cit.

⁵⁸⁰Ibid.

⁵⁸¹ Anthony Aust, (2007). *Modern Treaty Law and Practice, second Edition*, (Cambridge, Cambridge University Press), p 200.

occur within the boundaries of States that are party to the Convention. If the damage occurs in a non-party state, then the Vienna Convention cannot be applied.

A Joint Protocol is in effect when the cause of damage if it happens within the boundaries of a state which is a party to the Vienna Convention can be made liable for the damage which occurred within the boundaries of a state that is a party to the Paris Convention⁵⁸².

The most surprising factor is that the major players (USA, China, Canada and Japan) of nuclear power projects are not yet signatories to Paris or Vienna Convention.

4.7.7 Injury

The Paris Convention and the Vienna Convention provide for compensation to injury sustained by the occurrence of a nuclear incident. But neither of the Conventions provides for the compensation of financial injury which may have taken place during the occurrence of the nuclear accident. Therefore, for the effective management of compensation for financial injury, the UAE should enact laws to this purpose.

4.7.8 Jurisdiction of courts

According to the Paris convention and the Vienna Convention, the court of law within the State wherein the incident took place, has the jurisdiction to entertain the claim. But there may be circumstances whereby the incident's location could not be ascertained. In such circumstances, the place where the plant is situated has the jurisdiction to the claims arising from the incident.

The major limitation of such a provision to try the claims of nuclear accidents is that there is no independent body or authority to deal with the claims arising from nuclear accidents that happen during transportation of nuclear active products from one country to another and in which the claimants may be from different nations. The stipulation is that the rule of law of the country wherein the claims are entertained will also affect the interests of

⁵⁸² Joint Protocol. Available at: http://www.iaea.org/Publications/Documents/Conventions/jointprot_status.pdf Accessed 2 June 2013.

the claimant, since it is the courts in the country wherein the operator holds its plant that holds the jurisdiction⁵⁸³.

In addition to the civil and criminal liabilities concerning nuclear risks, there are environmental liabilities also. The increased climatic change has not brought a change in the way the nations view nuclear power generation. There is just as much protection given to such plants as there was when nuclear power generation first started. There are governmental subsidies for the starting and running of nuclear power projects. However, the increasing climatic changes are an issue which gain more importance in the present scenario, which needs to quantify the compensation for environmental damage⁵⁸⁴.

4.8 Summary of Chapter Four

Nuclear power generation is the cheapest and most durable method of commercial production of power in recent times that has proved to be successful form any industrialised nations. The decision of the UAE to embark upon nuclear power generation methods is a prudent one when compared to the enormous growth of industry in the country and the requirement for more power. The constantly depleting fossil fuels also promote the growth of nuclear power production.

The greatest threat of nuclear power projects are as possible health and environmental hazards, usually caused by a leak or accident in the nuclear power plant. The UAE needs to take all precautionary measures possible to reduce the odds of such accident(s) or leakage by following the international standards for plant construction and operation. Since the operator of the nuclear power plant has the exclusive liability to claims that arise from nuclear accidents, according to the international Conventions, if the UAE is planning a state-owned project, it needs to procure all financial securities to be prepared for such claims.

⁵⁸³ Duncan Currie, op.cit.

⁵⁸⁴ Faure, M., (1995). 'Economic Models of Compensation for Damage Caused by Nuclear Accidents: Some Lessons for the Revision of the Paris and Vienna Conventions'. *European Journal of Law and Economics*, 2, pp 21- 43.

The country can accede to the international Conventions that deal with the compensation of victims in a nuclear accident, to receive help from the international organisations when there is a nuclear accident or leakage. This is because the repercussions of such accidents may have unimaginable outcomes which can affect persons from various countries. In such a situation, if there is a limitation in the liability amount as per the international Conventions, it would be helpful if there are other countries to support in a crisis.

The international framework has found a balance between the public interest and the interest of the nuclear power plant(s) operator. Since the operation of nuclear power plant carries such high risks, if too much stringent control is focused on the method of working, the investment in nuclear power projects would decline, consequently affect commercial progress. Thus, it is advised, a more stable method should be followed by the UAE. International co-operation is the key factor in having a successful nuclear age in the future.

CHAPTER FIVE

ANALYSIS OF THE ORGANISATIONAL AND LEGAL STRUCTURES OF THE UAE'S NUCLEAR PROGRAMME: THE NATURE OF INTERNATIONAL CO-OPERATION AND THE BENEFITS OF IMPLEMENTING THE PEACEFUL NUCLEAR PROGRAMME

5.1 Introduction to Chapter Five

The focus of this chapter is on the UAE and lessons learnt applicable to its future development of nuclear energy production. The benefits of nuclear power projects are numerous and include stable production of electricity in a more cost effective way, but their possible negative impacts are immeasurable particularly concerning radioactive emissions. This makes it necessary for a state to formulate effective legislations and regulations to control nuclear activities in the country. There are international instruments that deal with this aspect.⁵⁸⁵ Many countries, including the UAE, ratify such instruments to avoid possible negative effects of nuclear activities in the state. In addition to the effects of nuclear activities, the use of nuclear power for electricity generation, or for other peaceful purposes, would require the assistance of the international community, since it constantly necessitates the transportation of nuclear products between countries. Therefore, it is necessary to adhere to standards set in international tools.

The states have found it necessary to formulate a common code of regulations regarding the nuclear liabilities and standards of conduct, since there are limitations to the national legislations in various aspects. Examples of the instruments include UAE Law No 4 of 20012 and UAE Law No 6 of 2009. It is imperative to note that a nuclear mishap will likely incur potentially extensive fallout beyond the geographical boundaries of a country, which would result in difficulties forecourts of jurisdiction in deciding on claim petitions. The civil law that deals with such mishaps is not obvious when it comes to nuclear accidents. This makes it problematic for claimants to dispense their burden of proof. The

⁵⁸⁵ The international instruments include: The 1957 Paris Convention on Third Party Liability in the Field of Nuclear Energy, The 1997 Vienna Convention on Civil Liability for Nuclear Damage, The 1997 Joint Protocol, The 1997 Convention on Supplementary Compensation for Nuclear Damage, The Joint Convention on the Safety of Spent Fuel Management, The Non-Proliferation Treaty (NPT) etc.

author argues that if there no viable international regulations, it is possible that domestic laws could be used as the main form of dispute resolution and that UAE can benefit from this. This could possibly also be a substitute utilised by non-contracting parties for individual jurisdiction.

In the absence of an international code of regulations, the persons responsible for nuclear accidents may be burdened with unrestricted liabilities and such a situation would detrimentally affect investors in nuclear power projects⁵⁸⁶. This is dealt with by domestic law and consensus is that international instruments are necessary to deal with accidents caused by nuclear activity. The Vienna Convention on Civil Liability for Nuclear Damage and the Convention on Supplementary Compensation for Nuclear Damage were formed when: “It was felt that the adoption of an international regime for nuclear liability would facilitate the bringing of actions and the enforcement of judgments without too much hindrance by national legal systems”⁵⁸⁷.

The researcher perceives the above as being beneficial to the claimants or victims of nuclear incidents, believing that there is possibility that domestic laws may suffer from some interpretational and enforcement setbacks. To have detailed analysis of the issue of international assistance and cooperation it is necessary to understand the different international Conventions which deal with nuclear power projects. The nature of legal responsibility is different in the case of nuclear projects when compared to other industrial power activities. Therefore, it is necessary to understand the scope of legal responsibility under the various international Conventions.

Chapter Five evaluates the organisational and legal structures of the UAE nuclear programme, the legal responsibilities for nuclear activities from the international perspectives and the benefits of peaceful exploitation. The chapter also analyses the challenges facing peaceful nuclear programmes, ratification of global nuclear responsibility systems by non-member states, as well as the formulation of a single legal code for nuclear liability.

⁵⁸⁶ Schwartz, Julia A. (2010). “Liability and Compensation for Third Party Damage resulting from a Nuclear Incident”, *10th Anniversary of the International School of Nuclear Law*, (2010, OECD) p. 308.

⁵⁸⁷ Explanatory Texts, - The 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage. p. 5.

5.2 Legal Responsibilities for nuclear activities in the International Regime

Although a detailed analysis of the nuclear liability regime has been discussed in the previous chapter, it is appropriate to understand the international system of ascertaining the legal responsibilities.

From the international perspective, the burden of proof of the victim that an accident occurred due to the act or omission of the nuclear power operator is dispensed with. This means that the operator will be held strictly liable for any accident due to nuclear activity within the nuclear power plant. The Paris Convention (see Appendix 9) and the Vienna Convention (see Appendix 8) have included the strict liability principle within its scope in Article 3 and Article II (1) and IV (1) respectively. The researcher observes that the Paris and the Vienna Conventions were developed after the 1957 Windscale incident had happened. The 1957 Paris Convention was the first to be developed, following the Brookhaven Report published in the same year (1957) which was based on the Windscale disaster. The 1979 Three Miles Island, the 1986 Chernobyl and the 2011 Fukushima incidents all happened after the Paris and the Vienna Conventions were adopted. Therefore, it can be noted that this illustrates a positive approach from the international community. It is possible that the successes of these treaties can be enhanced through countries, including the UAE, taking them seriously.

The international Conventions that deal with nuclear power plants have made the operator of the plant wholly responsible for the damages caused by the nuclear activity. The Paris Convention, Vienna Convention and the Convention on Supplementary Compensation on Nuclear Damage's Annex (see Appendix 11) provides for the sole responsibility of the nuclear operator. The Paris Convention provides for the need of the operator to take out insurance. While the three international instruments provide for exceptions to the exclusive liability of the operator, the nuclear accidents that have attracted international attention have not been the result of any of the circumstances in the exceptions. In cases of moving nuclear active materials from one place to another, it is the sender who will be responsible for any damage(s) because of such transportation. Such liability will be imposed on condition that the sender is from a ratifying country. If the materials have reached the buyer, however, but have not been removed from the carrier, the

responsibility would still lie with the sender of the nuclear active product(s)⁵⁸⁸. The UAE will get its source of nuclear materials from South Korea.

According to most the international instruments there are no limitations to the responsibility of the nuclear power plant operator, except when the agreement clearly mentions that the operator will be limited in his responsibility or when an accident happens due to the act or omission of a person who undertakes action with the clear intention of causing damage(s). Although, Article X of the Vienna Convention clearly makes the sovereign state responsible also, if government money is involved in founding the power plant.⁵⁸⁹ The UAE will deal with this through ENEC, which is the official body to supervise the country's nuclear power programme.

Unlike the national laws, there is an upper limit of compensation payable by the person responsible for nuclear damages. The absence of the upper limit for compensation renders national laws insufficient for meeting those requirements specific to nuclear accidents. To assist and increase investments in the nuclear arena, such measures are taken to international level⁵⁹⁰. Such a method is widely criticised, since the upper limit on the compensation amount is fixed on the basis of insurance coverage available and not on the gravity of risks posed by nuclear accidents⁵⁹¹. In contradiction to this principle, Austria, Germany, Japan and Switzerland have all removed any upper limit on the compensation amount payable from the operator's obligation⁵⁹². Japan and Austria have not acceded to the international Conventions so far. The researcher assumes that the upper limit on the compensation amount can be determined by countries based on their involvement in the power programme and should be provided in the tort law.

The international instruments confer the power to restrict the amount liable by the nuclear project operator by the sovereign state where the plant is run. The method of restricting compensation payable differs with each international instrument. While there is a maximum limit for compensation and all of it is to be paid by the nuclear project's

⁵⁸⁸Stoiber, C, Baer, A, Pelzer, N, Tonhauser, W, P, (2003). *Handbook on Nuclear law*, (IAEA, Vienna, Austria), p. 116.

⁵⁸⁹ Article X of the Vienna Convention.

⁵⁹⁰ Julia A. Schwartz (2010op.cit.)

⁵⁹¹Norbet Pelzer "Main futures of the revised International Regime Governing Liability - Progress and Standstill", *10th Anniversary of the International School of Nuclear Law* (OECD), p. 368

⁵⁹² Ibid.

operator, the 1963 Brussels Supplementary Convention⁵⁹³ created the method of computation of compensation with three stages. It limits the exclusive liability of the operator to five million SDRs⁵⁹⁴ while between 5 million to 175 million should be paid by the state in which the power plant is situated.⁵⁹⁵ Any amount above 175 million, up to 300 million can be borne out from the combined funds of all the ratifying states. The upper limit of compensation was later increased to 1.5 billion.⁵⁹⁶

The Vienna Convention does not have a tier system but enables the sovereign state to put a limit on the compensation to be paid by the operator up to 300 million SDRs.⁵⁹⁷ It also empowers the state to make national laws which allow the use of state funds to pay compensation above 150 million SDRs without exceeding 300 million SDRs.⁵⁹⁸

According to the 1997 Convention on Supplementary Compensation (CSC) on Nuclear Damages, while there is no upper limit for the compensation payable by the operator within the Convention, it does facilitate the installation state's authorities to make such prescribed upper limits. This can be 300 million SDRs or above. The UAE sets it at 450 SDRs.⁵⁹⁹ The second tier of the Convention on Supplementary Compensation on Nuclear Damages allows the use of funds procured from the collection of all the ratifying states to pay for the damages above the limit in the first tier.⁶⁰⁰

Another concept in the international instruments relating to nuclear accidents is the limitation(s) placed on time in raising a claim. Since the corporate sector providing insurance for nuclear power projects limits the terms of insurance to a decade, maximum, this inflicts time limit restrictions within which nuclear damages claims need to be raised by victims⁶⁰¹. Although this seems a fair system, since the effects of nuclear activity might

⁵⁹³The Supplementary Convention on Third Party Liability in the Field of Nuclear Energy of 31 January 1963.

⁵⁹⁴SDRs (Special Drawing Rights) are a mixture of currency values determined by the International Monetary Fund (IMF). One SDR is currently equal to US\$1.54 (Dh5.66).

⁵⁹⁵ The Brussels Convention.

⁵⁹⁶ The Brussels Convention.

⁵⁹⁷ The Vienna Convention.

⁵⁹⁸ The Vienna Convention.

⁵⁹⁹ "The liability of the Operator to compensate for Nuclear Damage for any one Nuclear Incident shall not exceed 450 million SDRs." (See: Article 5(1) of UAE law No 4 of 2012).

⁶⁰⁰ Article 4 of Chapter 2 of the Convention on Supplementary Compensation (CSC) on Nuclear Damages.

⁶⁰¹Sebastiaan M. S. Reitsma and Mark G. Tetley (2010). "Insurance of Nuclear Risks", *10th Anniversary of the International School of Nuclear Law*, (2010, OECD), pp. 398

only be known several years after being exposed to such radiation, there can be no precision regarding the time of occurrence of the disease. The time lapse in identifying the occurrence of the disease after exposure to radioactivity will make it difficult to ascertain the real cause of the disease. According to the civil law in most of the states, including the UAE, the limitation period is set at 30 years⁶⁰².

However, Article 8(a) of the Paris Convention enforces the limitation period of nuclear damages that result in harm to life or hurt, stating it will come to an end ten years after the nuclear accident. This is mainly because the insurance providers limit the term of insurance to ten years (which is contractual and can vary). The Paris Convention provides for the freedom to expand the limitation period in each country through domestic legislation, if there are adequate measures taken to provide insurance covering the expanded period. The provision in the Paris Convention and the Convention on Supplementary Compensation on Nuclear Damages stipulates that such member state can mandate the victim to raise the claim within two and three years respectively.

The Vienna Convention further extends the limitation period to three decades after the nuclear accident if such claims relate to the harm to life or hurt of the person and if it relates to other types of compensation, the limitation period of the claims ends within a decade of the nuclear accident.⁶⁰³ The Vienna Convention has also left open the choice of expanding the limitation period by the sovereign state, if such expanded period can be appropriately covered by insurance policies. The Convention under Article VI (3) provides that such claims should be brought up within three years of the knowledge of the damage caused by nuclear accident.⁶⁰⁴ The UAE is equally aware of these and considers them in its nuclear laws.

The Vienna Convention, Paris Convention and the Convention on Supplementary Compensation on Nuclear Damages make it a mandatory condition for the operator to subscribe to an insurance policy that would cover the liability of the operator in the event of a nuclear accident. All three international instruments stipulate the same. Norbert Pelzer (2007) states that the mandatory provisions to subscribe to insurance policies that

⁶⁰²Stoiber, C, Baer, A, Pelzer, N, Tonhauser, W, P op.cit.

⁶⁰³ The Vienna Convention.

⁶⁰⁴ Article VI (3) of the Vienna Convention.

would cover the operator's liability would help both the harmed and the operator since the harmed persons will be guaranteed payment of claim through the insurance policy and the operator would be protected from huge amounts of claims with increasing claimants⁶⁰⁵.

Other than the method of insurance, there are other methods which are not as popular as insurance policies. One such is the collective use of funds from different operators to satisfy the claims that may arise in case of nuclear accidents. Another approach is to enable the state to assist the operators in covering the operator liability with state funds, provided the operator is made to pay a fixed amount⁶⁰⁶. The researcher argues that limitation on compensation is fair if it considers as basis the scale of injury/harm.

The international instruments also provide that if the methods used by the operators to cover their liability through insurance policies or other methods, are not enough to cover the entire liability, it is the state's responsibility to make up the remainder of the amount through state funds. Though the method of covering the rest of the amount with public funds is not desired, sometimes it becomes a necessity. According to Norbert Pelzer (2007), the use of public money to cover liabilities is not an appropriate choice. It is not appropriate because if it is granted without any condition for repayment even if one takes into account that the installation state (by licensing the installation), assumes responsibility for protected operation and preventing nuclear incidents, state coverage becomes detrimental to the economy of the market and may not comply with the 'polluter pays principle'. These notwithstanding, States use this option when private coverage does not work.⁶⁰⁷ The researcher also observes that, notwithstanding the above argument, it is possible that State coverage can be afforded by the UAE. This is because the country is economically buoyant enough to handle it possibly in such a way that would not affect the economy negatively. One clear reason for this is to ensure that the nuclear programme is operational and meeting required standards.

⁶⁰⁵ Norbert Pelzer, (2007). International Pooling of Operators' Funds: An Option to Increase the Amount of Financial Security to Cover Nuclear Liability? *Discussion Paper for the IAEA INLEX Group Meeting on 21-22 June 2007*. 2007 *Nuclear Law Bulletin* No. 79, p. 38.

⁶⁰⁶Stoiber, C, Baer, A, Pelzer, N, Tonhauser, W, P op.cit.

⁶⁰⁷Ibid. p. 39.

In addition to the appropriation of liability when a nuclear accident happens, it is important to determine the jurisdiction of courts to decide on the claims arising from such accidents. Importantly, the international instruments have definite rules in deciding on which courts have jurisdiction over claims from nuclear accidents. The routing of claims to a single court that has jurisdiction, according to the international rules and regulations, will help in making the legal aspects clear and certain. This will also prevent the claimants from misusing the option of choosing the forum according to their interests⁶⁰⁸. The courts of the coastal states members are burdened with jurisdiction over nuclear accidents or activities that happen within the Exclusive Economic Zone (EEZ). Such principle does not consider the fact that victims of the nuclear accident reside in a different country⁶⁰⁹.

After a claim is settled by a court that has jurisdiction over the issue according to the international instrument, the next stage would be implementation of the judgements. According to all the international instruments, the ratifying countries are duty bound to enforce the judgement of the court of a contracting state and to eliminate any instances of reviewing such judgements within another contracting state. The researcher observes lacking is an appeal system associated with judgements, which makes it difficult for injured parties to bring actions and enforce any judgements. The researcher therefore opines that UAE should consider a system whereby all parties involved in claim cases are accorded due treatment based on fair hearing.

No intolerance can be made based on caste, creed, religion or nationality while deciding or enforcing claims arising from nuclear accidents. This is to protect the interests of the casualties of nuclear accidents in the state in which the incident(s) took place, as well as those from other countries.⁶¹⁰

The international legal principles concerning nuclear accident claims are detailed above. The need to adhere to these principles arises because of various factors. The UAE aims to maintain appropriate standards in pursuing its nuclear power programme. The next

⁶⁰⁸Stober et al, op. cit., Ulrich Magnus (1999). Intercontinental Nuclear Transport from the Private International Law Perspective, *in* Reform of Civil Nuclear Liability: Budapest Symposium, p. 282.

⁶⁰⁹ A paper by the International Expert Group on Nuclear Liability (INLEX), Civil Liability for Nuclear Damage: Advantages and Disadvantages of Joining the International Nuclear Liability Regime, p.5.

⁶¹⁰ Stoiber et al, op.cit.

section therefore, scrutinises the way the UAE imbibes these principles in their legal system.

5.3 The organisational and legal structures of the UAE nuclear programme

The UAE, in a bid to increase power generation through nuclear energy has taken two main steps which include: the enactment of a Policy on the Evaluation and Potential Development of Peaceful Nuclear Energy and the Federal Law by Decree No. 6 of 2009⁶¹¹. The Federal Law of 2009 Concerning the Peaceful Uses of Nuclear Energy is termed as the UAE Nuclear Law (see Appendix 6). According to the UAE Nuclear Law, the country's objective is to comply with the international instruments that have been ratified by the country in relation to nuclear power.

According to the Policy on the Evaluation and Potential Development of Peaceful Nuclear Energy, it is clearly indicated that the domestic system which deals with nuclear energy related claims is inadequate to meet the global impact of nuclear incidents and therefore, it is necessary to comply with the provisions of the international instruments that relate to damages to be paid for nuclear incidents. It also stipulates that the independent system of nuclear responsibility would lead to the formation of a system that relates to third-party damages in line with the IAEA guidelines⁶¹².

Regarding the provisions of the Nuclear Law of 2009, the Federal Authority for Nuclear Regulation (FANR) was formed to control nuclear activity in the country. FANR is bestowed with the power to control and standardise the conduct of nuclear reactors.

As stated above, the Policy on Nuclear Energy aims to comply with the provisions of international instruments, while running nuclear power projects. In order to achieve this objective, the UAE has ratified the Vienna Convention on Civil Liability for Nuclear

⁶¹¹*The Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy*, <http://www.fanr.gov.ae/En/Documents/whitepaper.pdf> last accessed on 15-07-2013 and Federal Law by Decree No 6 of 2009 Concerning the Peaceful Uses of Nuclear Energy, UAE Official Gazette, Ministry of Justice, Issue No. 498, September 2009, p.11. Also at: http://www.fanr.gov.ae/SiteAssets/PDF/20101024_nuclear-law-scan-eng.pdf. Last accessed on 15-7-2013.

⁶¹² *The Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy*, op.cit.

Damage⁶¹³ and the 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention⁶¹⁴. After the ratification of the Vienna Convention in the year 2012, the UAE enacted the Federal Law Decree No. 4 of 2012, enumerating the rules and regulations regarding the responsibility for harm caused by nuclear accidents⁶¹⁵. The country has incorporated the legal principles in the Vienna Convention to the domestic legislation, to prepare for the nuclear energy programme. It has also taken most of the basic legal principles of liability that are enshrined in the Vienna Convention.

The Nuclear Liability Law of the UAE has adopted the principle of routing the entire liability of a nuclear damage to the operator of the nuclear power plant. The principle of strict liability is also enshrined in the domestic legislation of the UAE. There is strict provision to have the operator's liability wholly covered by insurance policies to a maximum limit of 450 million SDRs.⁶¹⁶ In circumstances whereby the companies that provide indemnity benefit to the operator are unable to cover the whole amount; the government undertakes to pay the excess amount to the victims. The national legislation of the UAE also provides for a limitation period of 30 years (for any damage caused to either human health or life) and 10 years (for other losses). It also provides for damages payable. The state additionally complies with the international instruments in ensuring equal treatment of all claimants without any bias based on colour, nationality, place of birth or residence.

According to the UAE Nuclear Liability Law, it aims at controlling and fixing the extent of civil responsibility and damages for harm caused by nuclear accident and the radiation occurring thereby. The law also necessitates the operator to be economically supported through all possible methods to tackle the financial need that may arise from a nuclear accident. The lacunae in the said legislation are to be fulfilled by the provisions in the Vienna Convention on Civil Liability for Nuclear Damage, 1997.⁶¹⁷

⁶¹³ Reproduced in IAEA document INFCIRC/566

⁶¹⁴ Reproduced in IAEA document INFCIRC/402

⁶¹⁵ Federal Law by Decree No. 4 of 2012 Concerning Civil Liability for Nuclear Damage, Addendum to the UAE Official Gazette, Ministry of Justice, Issue No. 45, August 2012, p. 9. Also at: <http://www.fanr.gov.ae/En/AboutFANR/OurWork/Documents/Federal-Law-by-Decree-No-4-of-2012-Concerning-Civil-Liability-for-Nuclear-Damage-English.pdf> Last accessed on 15-7-2013.

⁶¹⁶ The Principle of Strict Liability.

⁶¹⁷ The UAE Nuclear Liability Law.

The regulatory authority established under the legislation has the power to exempt nuclear projects or materials from the purview of the said Act.⁶¹⁸ To make such exemptions, however, there are certain conditions to be fulfilled: it is mandatory the nuclear project intended for exemption by the authority established under the UAE legislation needs to satisfy the conditions laid down by the IAEA. Once and only if such conditions are fulfilled, are they accepted by the FANR and exemption of the nuclear project is valid.⁶¹⁹ To exclude tiny amounts of nuclear reactive material from the coverage of the legislations in the UAE, such a quantity should not exceed the upper limits specified by the IAEA's Board of Governors. A decision of the FANR to exempt such measures of the nuclear active material within such upper limit, should then follow.

The Vienna Convention gives a choice to the contracting nation to exclude itself from harm, resulting in a nation that has not complied with the Convention by Article I A (2) and (3) of the Convention. Nevertheless, the UAE has not opted to exempt itself from the liability of damages caused in a non-ratifying country. So, the operator in the UAE will be made liable for damage that happens in any part of the world, if that arises due to radiation emitting from the plant for which he is responsible.

According to the arguments put forth, if the damages suffered in non-ratifying countries are also to be compensated, the upper limit on the liability of the operator would affect the interests of the injured parties. When the extent of liability increases, the distribution of the compensation to a larger number of victims would reduce each victim's compensation amount, without anything in return⁶²⁰. Since the UAE has ratified the Joint Protocol of 1988, the scope of paying compensation has been expanded to victims in countries that have also ratified the Joint Protocol. According to the Article 12 (1) of the UAE Law No 4 of 2012, Federal Courts in the Emirate of Abu Dhabi shall have exclusive jurisdiction over actions arising pursuant to this Law by Decree. The courts are the competent courts of jurisdiction for such cases.

⁶¹⁸ Article 3 of the UAE Nuclear Liability Law.

⁶¹⁹ See: The UAE Nuclear Liability Law.

⁶²⁰ Explanatory Texts: The 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage. p. 29.

5.4 Definition of and conditions for nuclear damage

A ‘nuclear incident’ can be described under the 1997 Protocol (see Appendix 10) as “some incidences or sequence of incidences holding the similar source which initiates nuclear loss or produces a severe and looming risk of producing such loss.”⁶²¹ The last turn of phrase was added to the 1963 Convention. So far, there is no explanation of ‘severe and major loss’ as could be seen in Level 7 on the INES (see Chapter 4), but it is obvious that it must be a severe as well as major risk of causing ‘nuclear damage’. Being a major cause would not be sufficient. Moreover, it is also not mentioned who will determine whether a risk is ‘severe and major’. A serious and severe threat as labelled by coastal state(s), may not be perceived as such by others, which have an opposite view; however, the ‘grave’ may be defined under the *lexfori*, although suitable steps were taken.

Nevertheless, precautionary steps are an area under discussion by those capable establishments where the steps were determined,⁶²² which might be held responsible for the rise of a debate that rules and guidelines that government should choose what precautionary steps represent a severe and major threat. Nonetheless, this is counteracted by the description of ‘reasonable measures’, which are to be understood per se by the ‘law of competent court’,⁶²³ that clearly means that rules of the court having authority under the Convention, involving any principles of such law and relevant to disagreement of regulations.

The 1997 Protocol could have focused on and deliberated about this but did not: precautionary measures can be explained as the suitable steps adopted right after a nuclear occurrence, dependent on the approval of capable and knowledgeable establishments by the regulations of the State where the steps were determined.⁶²⁴ Suitable steps can be

⁶²¹ Article 2 3(1) of Revised Vienna Convention. The IAEA 1997 Protocol to Amend the Vienna Convention on Civil Liability.

⁶²² Article 2 4(n) of Revised Vienna Convention. The IAEA 1997 Protocol to Amend the Vienna Convention on Civil Liability.

⁶²³ Article 2 4(o) of Revised Vienna Convention. The IAEA 1997 Protocol to Amend the Vienna Convention on Civil Liability.

⁶²⁴ Article 2 4(n) of Revised Vienna Convention. The IAEA 1997 Protocol to Amend the Vienna Convention on Civil Liability.

explained as the steps which are found under the law of the capable court, to be suitable and balanced, having concern with all the conditions.⁶²⁵

Hence, the reviewed Convention is in the investigative state where ‘nuclear occurrence’ is to involve incidents which generate a risk of creating nuclear loss, regarding precautionary steps, but where remedial steps are described as steps taken ‘after a nuclear incident has happened’. If we consider good judgement and practical understanding, it may look like a ‘nuclear mishap involves a sequence of incidents which create a severe and significant threat that precautionary steps are intended to prevent; this gives the impression of being a potential ‘catch-22’ where a government facing risk of a nuclear incident, in a case where the only nuclear loss is endangered, will have to make a decision without any doubt of reimbursements.

Similarly, a dispute can be initiated on the issue of whether a risk is severe and major. Whether a drifting radioactive cloud goes with a flow in a certain direction or for an indeterminate distance could intensify heated discussion as to whether an occurrence is expected to give rise to radioactive discharge at all. Whether a radioactive transference which is confronting problems like a crash, fire or terrorist activity comprises a severe and significant threat is where further dispute(s) can arise. A worker may debate that a risk was not significant, and if in case it was, that it was not severe by way of threatening enormous destruction.

The 1963 phrasing was used by the Paris 2004 Protocol,⁶²⁶ while the Paris Convention succeeds it by introducing enhancements on the condition that such incidents or series of incidents, or any other loss caused, is a consequence of radioactive characteristics, or an amalgamation of characteristics of radioactivity with poisonous, explosive or other dangerous characteristics of nuclear fuel or radioactive items or waste or with any of them, or from the ionised form of radiations discharged by any source of radiation within a nuclear connection.⁶²⁷

⁶²⁵ Article 2 4(o) of Revised Vienna Convention. The IAEA 1997 Protocol to Amend the Vienna Convention on Civil Liability.

⁶²⁶ The Paris 2004 Protocol.

⁶²⁷ The Paris Convention.

The reviewed Vienna Convention is, therefore, the most progressive when it comes to the description. Regarding the warnings in mind, the definition of nuclear loss is explained as follows:

In agreement with the 1963 Vienna Convention, the UAE Nuclear Law has specified certain conditions for compensating damages. As analysed above, the operator of the nuclear project is responsible exclusively for the damages caused by nuclear accidents. The liability of the operator is strict liability, which dispenses with the burden of proof of the victim to show recklessness on the part of the operator in causing such accident or damage.⁶²⁸

Therefore, nuclear damage according to the UAE Nuclear Law, deriving from the Article 2 (2) of the IAEA 1997 Protocol to Amend the Vienna Convention on Civil Liability and as existing international instrument, is defined as:

- “(i) Loss of life or any personal injury;
- (ii) Loss of or damage to property;
- (iii) Economic loss arising from loss or damage not referred to in paragraphs (1) or (2) above, incurred by a person entitled to claim for compensation in respect of such loss or damage;
- (iv) The costs of measures of reinstatement of impaired environment, unless such impairment is insignificant, if such measures are taken or to be taken, and insofar as not included in paragraph (2) above;
- (v) Loss of income deriving from an economic interest in use or enjoyment of the environment, incurred because of a significant impairment of that environment, and insofar as not included in paragraph (2) above;
- (vi) The costs of preventive measures, and further loss or damage caused by such measures;
- (vii) Any other economic loss, other than loss caused by the impairment of the environment, to the extent that the loss or damages referred to in paragraphs 1-5 and 7 above have emerged from or resulted from ionizing radiation emitted from any radiation source within a Nuclear Installation, or emitted from Nuclear Fuel, Radioactive Products or Waste in a Nuclear Installation, or of Nuclear Material

⁶²⁸ The UAE Nuclear Law.

coming from, originating in or sent to a Nuclear Installation, whether arising from the radioactive properties of such material or from a combination of radioactive properties with, toxic, explosive or other hazardous properties of such material. The Cabinet may issue instructions related to the implementation of the provisions of paragraphs 1-7.”⁶²⁹

The court that has jurisdiction to decide on the damages to be paid has no prudence or discretion to decide on the payment of certain types of compensation that are enumerated above. The definition of nuclear damage also includes other financial damage not including the loss of environmental standards. It also excluded the power of the law of the court to decide on such injuries. The relevant ministry of the UAE was given power to decide on the types of compensation available. The influence of politics is undeniably present in such a system of deciding on the types of compensation that would be available to the victims of a nuclear accident, rather than giving such power to the courts to decide on the kind of damages to be paid. It is often argued by observers that although the power to give instructions are left open to the ministry of cabinet in the UAE, these instructions do not bind them and there is no obligation for the deciding court to go by such instructions.

The mandatory provision to cover the liability of the operator by insurance policies or other financial instruments exists in the UAE.⁶³⁰ The maximum limit of the operator has been fixed as 450 million SDRs. It is mandatory for the operator to have insurance policies to an extent of 450 million SDRs or up to five million SDRs if there are research reactors, reactors that run on less power and convenience for storage of radioactive material. But whereby the whole liabilities are not covered through insurance, the UEA Nuclear Law provides that public money could be used to make up for the rest of the amount.⁶³¹

According to paragraph 5 of Article 8 of the UAE Nuclear Liability, if the operator fails to obtain insurance policies for the required amount of liability, the government can immediately provide coverage for the amount for which the insurance coverage is

⁶²⁹ Article (1) of the Federal Law by Decree No. 4 of 2012 Concerning Civil Liability for Nuclear Damage

⁶³⁰ Ibid. Federal Law by Decree No. 4 of 2012 Concerning Civil Liability for Nuclear Damage.

⁶³¹ Ibid. Federal Law by Decree No. 4 of 2012 Concerning Civil Liability for Nuclear Damage.

required. The government could also give an alternative method of granting time to procure insurance coverage for the said amount while covering the liability through government funds directly⁶³². This is a good thing. The Vienna Convention stipulates that if the operator fails to get insurance coverage in part or in full for the amount of liability, the government must provide the public funds to cover such liabilities. The UAE Nuclear Law however, offers the power to decide whether public funds should be used to cover the liabilities of the operator as opposed to the provisions in the Vienna Convention⁶³³.

The UAE Nuclear Law provides that the operator could turn to another person to satisfy the liability of the operator in some circumstances which would otherwise have to be borne by the operator himself. Article 11 of the UAE Nuclear Liability Law stipulates that if the contract has an express condition that the operator has the right of recourse or the accident was purposefully caused by another person.⁶³⁴ In the second circumstance, the operator could sue such a person deemed responsible for the accident.

The UAE's ratification to the 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention has made it possible to extend the scope of damages payable by the operator and has helped in reducing the chances of disputes regarding the application of a convention, since it provides that only one convention would be applied to a nuclear incident⁶³⁵.

The provisions of the Joint Protocol become helpful in cases of nuclear accidents that occur during the movement of nuclear active materials from one country to another⁶³⁶. According to the Vienna Convention, when nuclear material is moved from one place to another, the operator who transmits the material will be responsible until the other

⁶³² Article 8 (5) of the Federal Law by Decree No. 4 of 2012 Concerning Civil Liability for Nuclear Damage, p. 6 and Johan G. Lammers, *International Responsibility and Liability for Damage Caused by Environmental Interferences*, ENVTL. POL'Y & LAW (2001), at 99 available at: <http://iospress.metapress.com/media/2gurmhtuxn0jtcj2cb9q/contributions/q/5/6/p/q56pjpg9bw6qy6pq7.pdf> Last accessed on 15-7-2013.

⁶³³ Explanatory Texts, op.cit., p. 44 and Jason Zorn, *Note: Compensation in the Event of a Terrorist Attack on a Nuclear Power Plant: Will Victims Be Adequately Protected?* 38 NEW ENG. L. REV. 1087, 1128 n. 310 (2003) and 2002 Plan of Implementation of the World Summit on Sustainable Development. World Summit on Sustainable Development, Aug. 26 - Sept. 4, 2002, Johannesburg, South Africa, *Plan of Implementation*, §§ 15(b), 19(b) (Sept. 10, 2002). Available at: http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf Last accessed on 15-07-2013.

⁶³⁴ Article 11 of the UAE Nuclear Liability Law

⁶³⁵ Julia A. Schwartz op.cit.

⁶³⁶ Explanatory Texts, op.cit.

operator takes on the responsibility of the material⁶³⁷. When a radioactive material is transmitted to a country which has not acceded to the Conventions, the sender will be responsible until the radioactive material is taken out of the transporting vehicle. If the sender is from a non-ratifying country, then the receiving operator will be responsible from the time the material is shipped from the non- ratifying state to the ratifying state⁶³⁸.

In case of a nuclear accident during the relocation of the radioactive material from one country to another, the operator in the UAE will be liable for the harm caused by such incident in a state that has not accepted the Vienna Convention or the Joint Protocol. Therefore, the accession to the Joint Protocol has extended the scope of the application of the international Convention.

An important aspect of acceptance of the Vienna Convention and the Joint Protocol is that physically, the UAE is located far away from the other countries which have acceded to the Convention and the Protocol. Therefore, the application of the Vienna Convention in relation to such countries may be remote. On the other hand, the UAE's accession to the Vienna Convention and its acceptance of the Convention and the Joint Protocol has effectively demonstrated its interest in joining the other international participants in helping to assist each other in building a strong nuclear culture.

The operator is responsible for the damages caused by a nuclear accident.⁶³⁹ A person or company that provides economic backing to the operator can also be made the opposite party for a claim for damages due to nuclear accident. The UAE Nuclear law also incorporates the mandates of the Vienna Convention in Article 10 and includes the stipulation that a claim for nuclear damage should be raised within three decades if it concerns damage to life or body and within a decade if it relates to harm of any other kind. According to Article 10 of the UAE Nuclear Law, if the claim exists after the

⁶³⁷Ibid. Explanatory Texts, op., cit.

⁶³⁸Stoiber et al, (1992). op.cit and H.J. Ewers and K. Rennings, *Economics of Nuclear Risk - a German Study*, in Social Cost of Energy, Present Status and Future Trends, 150, 157 (O. Homeyer and R. Ottinger eds., Springer-Verlag, 1992).

⁶³⁹ Article 10 of the United Arab Emirates Nuclear Liability Law.

limitation period and if the financial security of the operator becomes invalid the claim cannot be made.⁶⁴⁰

The jurisdiction of courts is another issue when it comes to the decision on claims of damages arising from nuclear accidents. Wherever the law is silent the provisions of the Vienna Convention apply.⁶⁴¹ The court of the country wherein the nuclear project runs is deemed competent to decide on claims of damages if such accident occurs within a ratifying state.⁶⁴² But if the accident occurs outside a ratifying State, the jurisdiction of the court is determined according to the nationality of the operator. For damages that occur from nuclear incidents within the EEZ of a ratifying state, the courts of such contracting state will have the jurisdiction over the claims for damages. The UAE Nuclear Law provides that the courts in Abu Dhabi are the only courts having power to deal with the claims that arise from the provisions of the UAE Nuclear Liability Law.

The implementation of the provisions of the UAE Nuclear Law is on FANR. FANR formulates the guidelines for the execution of the country's Nuclear Liability Law. The provisions of the insurance scheme, employee benefits or other plans of damages will not be affected by the stipulations in the Nuclear Law.⁶⁴³

The above analysis shows the importance given to the international assistance and international instruments by the UAE's authorities. Accordingly, "the establishment of such a robust nuclear liability regime is another step forward in the UAE Government's responsible approach towards developing a solid regulatory framework for the peaceful nuclear energy programme."⁶⁴⁴

⁶⁴⁰ Article 10 (2) of the Federal Law by Decree No. 4 of 2012 Concerning Civil Liability for Nuclear Damage, pp.7 and Greenpeace International, *Review of Estimates of the Costs of Major Nuclear Accidents*, prepared for the 9th Session of the Standing Committee on Nuclear Liability of the IAEA, Feb. 7-11, 1994.

⁶⁴¹ The UAE Nuclear Law.

⁶⁴² The Vienna Convention.

⁶⁴³ The United Arab Emirates Nuclear Liability Law.

⁶⁴⁴ Khaleej Times, UAE Newspaper, "UAE issues Nuclear Liability Law, Explanation of the Law was made today by Hamad Al Kaabi, the UAE's permanent representative to the International Atomic Energy Agency (IAEA) and Special Representative for International Nuclear Cooperation, during a press conference held at the Federal Authority for Nuclear Regulation (FANR) headquarters in Abu Dhabi, 15 October 2012 and Ben McRae, *The Compensation Convention: Path to a Global Regime for Dealing with Legal Liability and Compensation for Nuclear Damage*, 61 NUCLEAR LAW BULLETIN 25, 33 (1998).

The country's policy on nuclear peace projects makes the governmental authorities also responsible to an extent, for the liabilities of the operator. It increased the maximum limit of compensation from the limit specified in the Vienna Convention and gives a part of the responsibility to the government of the UAE.

Unlike the Vienna Convention, the nuclear liability regime of the UAE makes the operator liable for harm caused by the nuclear incident arising from the nuclear power plant run by him/her, irrespective of the country in which such harm occurred. Thus, the extent to which the liability to which the country's Nuclear Law applies has been widened by the domestic legislation.

The UAE has shown its agreement with the international community by cooperating with other nations toward building a robust international standard for dealing with the damages caused by nuclear accidents. Although joining the Joint Protocol does not, in effect, make much difference to the responsibilities of the operator or government authorities, since other countries that have ratified to the Paris Convention are situated so far, geographically speaking, from the UAE. However, the ratification of the Joint Protocol illustrates the positive attitude the UAE government has towards the international assistance and mutual support.

5.5 Benefits of peaceful exploitation of nuclear energy

As stated previously, there has been continuous growth in the demand of energy due to increased globalisation and industrialisation. The increasing costs incurred in the traditional methods using coal and water for energy production has increased the need for voluminous and cheap production of energy through nuclear reaction⁶⁴⁵. Another important factor that increases the use of nuclear energy for power production is the change in energy policies among countries, to include all possible sources of power generation to reduce dependence on only one source of energy production. There are other important reasons that heighten the need for a change in the method of electricity production, including the ill effect the old-fashioned methods of electricity production

⁶⁴⁵ World Energy Outlook 2006, 2007, and 2008 and Global Conference on the Sustainable Development of Small Island Developing States, Bridgetown, Barbados, April 25 - May 6, 1994; *Programme of Action for the Sustainable Development of Small Island Developing States*, U.N. Doc A/CONF.167/9 (Oct. 1994).

have on the environment and climate. This also encouraged the government authorities to consider nuclear power generation.

There is possibility of nuclear energy being used for aggressive and violent methods of warfare. The production of power through nuclear energy goes through two stages of collecting nuclear active materials and the augmentation of technology and skills that can be used for destructive purposes⁶⁴⁶.

Nuclear energy, if used for peaceful purposes can reduce its effects on the environment and can offer a remedy for the increasing demand of energy. This can also replace other fuels that are depleting rapidly and take millions of years for generation. Nuclear active products can be re-treated and used multiple times and the amount of fuel required to produce energy is a lot less when compared to the old methods of power production. The UAE is looking at retreatment and reprocessing of nuclear fuels.

5.6 Challenges of Peaceful Nuclear Activities

As previously discussed, there are various challenges to the peaceful use of nuclear activities. The most important is the fear that nuclear active materials which are capable of being deployed for destructive purposes may be misused by countries using nuclear power projects. The treatment of uranium products to be reused as fuel is one of how such countries can have unaccounted nuclear active material that can be used for destructive purposes. Countries like Pakistan, Malaysia and the UAE have not ratified the Nuclear NPT (see Appendix 13) which could lead to the misuse of nuclear active materials, since these countries are not duty bound to have a system restricting the export of such materials⁶⁴⁷. The failure of countries to formulate effective policies and regulations to keep surveillance on the export of nuclear active materials has affected the steps taken internationally for effective control of proliferation of nuclear energy. The author opines

⁶⁴⁶ 'Addressing verification challenges', Proceedings of the International Safeguards Symposium on addressing verification challenges; IAEA and Institute of Nuclear Materials Management and European Safeguards Research and Development Association; Vienna, 16-20 Oct. 2006. [Online]: available at: www-pub.iaea.org/mtcd/publications/pdf/pl298/pl298_book.pdf. Last accessed on 15-7-2013.

⁶⁴⁷ G. Milholin and K. Motz, "Nukes 'R' Us", *The New York Times*, March 4, 2004, p. A31; D. Albright and C. Hinderstein, "Uncovering the Nuclear Black Market: Working Toward Closing Gaps in the International Proliferation Regime", *Institute for Science and International Security*, July 2, 2004; F. Stockman, "U.S. Prods U.N. for a Nuclear Export Rule Measure Sought to Halt the Spread of Weapons Data", *The Boston Globe*, April 4, 2004, p. A4

that it should be made compulsory that countries considering nuclear power should ratify the NPT. It should be a major requirement and should be enforced accordingly.

The invention of energy production from nuclear active materials has led to a revolution in the field of energy generation. The international community is aware of the extent of the harm that nuclear accidents can cause. The Chernobyl accident was the first of its kind that affected millions of people across the world. The effects of nuclear incidents have been felt through the generations. Hence, the need for an organised structure to combat nuclear accidents and responsibilities became necessary. The effect of nuclear accidents transcends geographical boundaries of nations. This makes radioactive accidents an international concern.

During the latter half of the twentieth century, the need for international assistance was agreed upon by sovereign states. This brought about the formation of international conventions and treaties that provided a basic structure of liability of the operators and the nation states. The fact that the victims of a nuclear accident will be spread across different countries would mean that their claims may have to be implemented in different nations and if there is no uniformity in the method of fixing the liability and the implementation of the judgements, it would make it difficult for already harmed persons⁶⁴⁸.

As analysed in the earlier part of this chapter, there are various international instruments established by the international community. These include: the Vienna Convention, the Paris Convention, the Brussels Convention, the CSC, the Joint Protocol, the Brussels Convention and the Protocol to the Paris Convention. While much has been done to enact various international instruments, out of all the nuclear power structures around the world only fifty percent is situated within countries that have ratified these international instruments⁶⁴⁹. This means that not more than fifty percent of the existing nuclear power

⁶⁴⁸ Explanatory Texts, op.cit.

⁶⁴⁹ A paper by the International Expert Group on Nuclear Liability (INLEX), - *Civil Liability for Nuclear Damage: Advantages and Disadvantages of Joining the International Nuclear Liability Regime*, pp.1 and Directive of the European Parliament and of the Council 2004/35/EC, on environmental liability with regard to the prevention and remedying of environmental damage, art. 4, 2004 O. J. (L 143/56), available at http://europa.eu.int/eur-lex/pri/en/oj/dat/2004/l_143/l_14320040430en_00560075.pdf Last accessed on 15-7-2013.

projects are covered by the international instruments now in force⁶⁵⁰. The UAE is well placed to meet the requirements for embarking on its nuclear power programme.

5.7 Summary of Chapter Five

The most important aspect of the international law on nuclear liability is that the compensation available for the injured in a nuclear incident has been limited to an amount as mentioned in various international instruments. Even though there has been an increase in the limit by recent Conventions, states that have not harnessed nuclear energy for power production but are vulnerable to the effects of nuclear incidents may not accept such upper limits of compensation available to the injured.

The applicability of the law of the operators' country and the power given to such states to determine the maximum limit of damages that needs to be paid by the operator have become a concern for non-nuclear states. It is also required to have a supplementary financial backing for nuclear accidents, lest the operator who is the sole liable person refuses to pay the victims the compensation for such injury when a nuclear accident occurs, the supplementary financial fund can be used to compensate the injured for the injury caused. According to the Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, if the injured is not satisfactorily compensated for the injury suffered, the Convention provides for an additional financial set up that can be used to fully compensate the injured⁶⁵¹.

On the overall analysis of the provisions in the existing international Conventions, it can be deduced that provisions are made to cater for the needs of nuclear investors and are less bothered about the wellbeing of the injured in nuclear accidents. Since there is an increase in harnessing nuclear energy, there should be effective provisions to also safeguard the interests of the injured. The provisions in the Conventions were intended to

⁶⁵⁰ Simon Carroll, 'Perspective on the pros and Cons of a Pooling-type Approach to Nuclear Third Party Liability', 2008 *Nuclear Law Bulletin* No 81, pp.82; Testimony by Anna Aurilio of the U.S. Public Interest Group to the Committee on Energy and Commerce. Available at: <http://energycommerce.house.gov/107/hearings/06272001Hearing305/Aurilio492print.htm> Last accessed on 15-7-2013; Renewable Energy Policy Project, July 2000, "Federal Energy Subsidies: Not all technologies are created equal," available at http://www.crest.org/repp_pubs/pdf/subsidies.pdf Last accessed on 15-7-2013.

⁶⁵¹ The Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, art. 38, 3(b), May 3, 1996, 35 I.L.M. 1406 (1996).

increase investment in nuclear projects. Since there has been drastic increase in such investments and the number of nuclear projects and, although the countries would be economically affected by such investments, there is need to cater for the injured since the nuclear accidents can be extremely disastrous.

The researcher therefore suggests that as the UAE is embarking on its peaceful nuclear programme, it should consider the wellbeing of the public whether they become victims of any possible incidents or not. The protection of the populace should be considered paramount in the overall aspects of the programme.

CHAPTER SIX

ANALYSIS AND DISCUSSION OF RESEARCH RESULTS

6.1 Introduction to Chapter Six

Chapter Six marks the commencement of the PhD elements of the research. It is the data analysis and discussion part of the study. Here, the primary data collected during interviews with experts in the field of nuclear energy is analysed and discussed. In doing so, some local and international legal instruments, case laws and best practices are explored and utilised for balanced arguments. This is to further explore and address different views on issues of concerns related to nuclear power development in the UAE.

To achieve this, various views of persons working in and closely associated with the nuclear energy programme in the UAE, as well as those involved in nuclear energy generation programmes in other countries are critically discussed. In order to attain a comprehensive discussion on the area of research, this chapter considers how the law is used to address various concerns raised on the course of interviews with experts in the field of nuclear energy development as in the case of the UAE. This chapter builds upon the knowledge and information of nuclear developments within UAE and is particularly helpful in light of the lack of published research in the field. Thus, it serves to provide primary information on the developments in the UAE.

As discussed in Chapter One, very important officers who have vast experience and are directly involved in the development of the UAE's nuclear programme were interviewed. In all, ten officials were interviewed. Three of them responded to legal and liability questions, three responded to political questions, two for the economic and two for the safety, security and environmental questions.

Officials A, B and C work with FANR and have experience in legal issues regarding nuclear power programme. Officials D, E and F are coordinators between departments of government (FANR and ENEC) and have experience in international relations. Officials G and H work with economic department and have links with FANR and ENEC. Finally,

officials I and J work with FANR and ENEC respectively, and both of them work in the safety and security departments.

The researcher is an employee of the Dubai Police employed in the Central Investigation Department (CID) related to the safety and security of Dubai, UAE. Also, the researcher is a member of the Committee dealing with the nuclear power programme of the UAE. Thus, reflexivity is part of the research process here, since the researcher has some pre-conceived notions about the imminent dangers involved in industrial catastrophe - safeguarding the safety and security aspect of lives and properties being central to his duties. Nuclear disaster is one such occurrence but the fallout is more tragic and long lasting.

Reflexivity has to do with the researcher's 'positionality'. This is self-imposed position of incorporating continual self-reflection - when undertaking qualitative methods of research particularly, in which interactive data collection, such as interviews, takes place.⁶⁵² Knowledge gets produced both by the interviewer and the respondents.⁶⁵³ The ideas about the research, the research aims and further research questions take shape through reflections upon the incidents and experiences.⁶⁵⁴ Living in the era of globalisation, the researcher is aware of nuclear accidents and/or incidents across the globe over the past few years. The reflections of such occurrences have prompted the researcher to consider the extent and types of liabilities the state should bear.

The research is not yet a part of, nor in any other way associated with any of these organisations or departments, like the FANR, ENEC and economic department. Hence, he has no knowledge regarding the actual legal, political and safety and security issues related to a nuclear project. So, he is an 'outsider' among the respondents. But he is aware that the requirements of stringent safety measures need to be implemented both in the nuclear plants and in their vicinities.

⁶⁵² Bourke, Brian (2014). 'Positionality: Reflecting on the Research Process', The Qualitative Report No. 19, pp 1-9.

⁶⁵³ Lives and Legacies: A Guide to Qualitative Interviewing by Ping-Chun Hsiung is licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License, August 2010. Available at <http://www.utsc.utoronto.ca/~pchsiung/LAL/reflexivity> last accessed: May, 2016.

⁶⁵⁴ See Bourke, Brian (2014).

The safety and security requirements are complemented by the liabilities and compensations procedures in case of nuclear accidents occurrence. Thus, the researcher is both an outsider as well as an insider in this regard.

6.2 Basis for thematic analysis and discussion of research results

Thematic analysis is the simplest and most basic form of qualitative analysis with flexibility.⁶⁵⁵ The researcher can read into the data, assess and discover patterns in the information gathered.⁶⁵⁶

The questions presented to the participants comprised of four categories. These include the legal and liability; political; economic as well as safety, security; and environmental categories. The idea behind this selection was to generate a wider and more robust informed decision on the area of interest. It is important at this point to know that the research questions, as well as the analysis and discussions of issues expressed are drawn from and cover the 19 milestones for nuclear power infrastructure development (2007) as outlined by the IAEA⁶⁵⁷ The answers presented by the participants are analysed in the next section below.

⁶⁵⁵ Braun, V. and Clarke, V. 'Using thematic analysis in psychology. *Qualitative Research in Psychology*, 2006, 3 (2). pp. 77-101. ISSN 1478-0887 Available from: <http://eprints.uwe.ac.uk/11735> Last accessed 01 May 2016.

⁶⁵⁶ Foundations of Qualitative Research in Education, *Thematic Analysis* available at <http://sites.harvard.edu/icb/icb.do?keyword=qualitative&tabgroupid=icb.tabgroup117226> Last accessed 9 May 2016.

⁶⁵⁷ These milestones include: National Position, Management, Legislative Framework, Regulatory Framework, Stakeholder Involvement, Site and Supporting Facilities, Environmental Protection, Nuclear Fuel Cycle, Industrial Involvement and Procurement. Others are Nuclear Safety, Safeguards, Radiation Protection, Electrical Grid, Human Resources Development, Emergency Planning, Security and Physical Protection, Radioactive Waste, Funding and Financing, Role of Government, Leadership / Commitment, Legal Framework and Rule of Law and Institution Building.⁶⁵⁷ The 19 milestones are further classified into four basic Categories. These are:

- i. Milestones that are common to all (even fuel)
- ii. Those that are more specific to nuclear (even grid)
- iii. All impact financing as opposed to funding
- iv. Those that indicate that government role is pervasive throughout all the milestones, but there is a unique impact on financing.

6.3 Legal and liability issues

This section focuses on the legal and liability issues of the UAE nuclear energy programme, with specific interest in the aspects of who has legal responsibility and bears potential liability for any nuclear incidents that may arise from the programme. Questions on legal and liability issues were presented to lawyers engaged in nuclear and environmental law practices. Also, officials from FANR and ENEC were targeted for this category of questions. The discussions of the feedbacks on these issues are given below:

a. Does the UAE have any specific domestic laws regarding nuclear liabilities?

From responses, it was gathered that the UAE has enacted two national laws to deal with its nuclear energy activities.⁶⁵⁸ These include the Federal Law by Decree No. 6 of 2009 (see Appendix 6) and the Federal Law Decree No. 4 of 2012 (see Appendix 5). These laws enumerate the rules and regulations regarding the responsibility for harm caused by nuclear accidents. The UAE Law Decree No. 4 of 2012 is more comprehensive and has tried to incorporate several aspects vis-à-vis nuclear liabilities. In addition, the country has enacted Policy on the Evaluation and Potential Development of Peaceful Nuclear Energy.

b. How can an actual claim be brought in the UAE?

The actual claim can be brought in the UAE, by following the same procedure as in the Vienna Convention (see Appendix 8), although the latest modifications to the Vienna and Paris Conventions are seriously ducked through exclusions and the modified Protocols (see Appendix 10) enjoy even more sparse participation than the original Conventions. For others such as the Supplementary Compensations (see Appendix 11), many major nuclear countries including UAE do not ratify them, because they are not enforced; those that are enforced are ratified.⁶⁵⁹

⁶⁵⁸ Official A (FANR, 20-08-2013).

⁶⁵⁹ Official B (FANR, 20-08-2013).

c. How long have the UAE nuclear energy laws been established?

Data gathered indicated that the UAE nuclear regime has been in existence for over four years with the Federal Laws Decree No. 6 and Decree No. 4 commencing in 2009 and 2012 respectively.⁶⁶⁰

d. What are the current legal sources for provision of the UAE nuclear energy programme?

According to the respondents, the current legal sources for the provision of the UAE nuclear energy programme include the international nuclear law, international treaties, Vienna Convention, Paris Convention and the UK Nuclear Law.⁶⁶¹

e. Are the UAE's national laws regarding nuclear energy programme enacted in line or compliance with international legal instruments?

Yes, it was gathered that the UAE nuclear laws were enacted in line or compliance with international legal instruments.⁶⁶²

f. What are the legal bases for the development of these laws?

The respondent(s) said that the legal basis for the development of UAE's nuclear laws are the international nuclear laws, conventions and treaties.⁶⁶³ The legal issues involved in a nuclear power project are within the scope of common laws regarding operations, safety, security and the environment. The basic laws and standards to do with nuclear power projects need to be resolutely followed. Besides, the 19 milestones for nuclear power infrastructure development (2007) set out by IAEA have also been considered.

⁶⁶⁰ Official B (FANR, 20-08-2013).

⁶⁶¹ Official C (FANR, 20-08-2013).

⁶⁶² Official C (FANR, 20-08-2013).

⁶⁶³ Official A (FANR, 20-08-2013).

g. What is the specified role of the Emirates' Nuclear Energy Corporation (ENEC)?

The specified role of ENEC is to oversee the operation of the UAE nuclear programme in conjunction with selected companies e.g. KEPCO.⁶⁶⁴

h. What legal principles does the ENEC follow (specifically about questions of potential liability)?

The legal principles that ENEC follows are contained in the UAE nuclear laws decrees No. 6 of 2009 and No. 4 of 2012.⁶⁶⁵

i. What does a construction licence entail (areas of provision)?

A construction licence involves the building of the nuclear plants. The international instruments make it mandatory to obtain license for operating, designing as well as building a nuclear power plant.⁶⁶⁶ The security measures are compulsory and need to be adhered to.⁶⁶⁷

The responsibilities and obligations set by international instruments revolve around the license holder. Article 9 of the Convention on Nuclear Safety states:

“[each] Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such operator meets its responsibility.”⁶⁶⁸

⁶⁶⁴ Official A (FANR, 20-08-2013).

⁶⁶⁵ Official A (FANR, 20-08-2013).

⁶⁶⁶ Official C (FANR, 20-08-2013).

⁶⁶⁷ Reece R, Garancher T and Cousin A, ‘Nuclear Projects in the 21st Century’, 2009 IBLJ 437.

⁶⁶⁸ Article 9 of the Convention on Nuclear Safety

A licence can be defined as:

“Any authorisation granted by the regulatory body to the applicant to have the responsibility for the siting, design, construction, commissioning, and operation or decommissioning of a nuclear installation”.⁶⁶⁹

Article 21 of The Joint Convention on the Safety of Spent Fuel Management also burdens the license holder with outlined responsibility⁶⁷⁰. In addition, the UAE Federal Law Decree No. 4 of 2012 Concerning Civil Liability for Nuclear Damage confers on the operator strict liability for nuclear damage upon proof that such damage has been caused by a nuclear incident as described in Article II of the 1997 Vienna Convention.⁶⁷¹

j. Do current regulations cover all aspects of liability? Is there scope for any improvement?

It was gathered from respondents that current regulations cover several aspects of liability.⁶⁷² Some argued that the current regulations do not cover all aspects of liability since current regulations are still new and are not yet tested.⁶⁷³ Therefore, if there is any damage beyond territorial boundaries, the country cannot be held responsible. In this situation, the Vienna Convention would cover the damage. This observation is to be examined in the latter part of this chapter.

k. How will UAE or the environment at large cope with the risks exceeding the insurance market's capacity?

The Vienna Convention has determined a standard amount to be paid as compensation, along with the relevant rules. The time duration and amount of payment has been set to a standard value, because unlimited responsibility may lead to the operator's ruination while holding the responsibility for a limited time and ceiling amount may affect the victims detrimentally, causing distress.⁶⁷⁴

⁶⁶⁹ Article 2 of the Convention on Nuclear Safety.

⁶⁷⁰ Article 21 of the Joint Convention on the Safety of Spent Fuel Management

⁶⁷¹ Article 3 of the UAE Federal Law Decree No. 4 of 2012 Concerning Civil Liability for Nuclear Damage.

⁶⁷² Official B (FANR, 20-08-2013).

⁶⁷³ Officials A and C (FANR, 20-08-2013).

⁶⁷⁴ Official C (FANR, 20-08-2013).

l. The 1997 Vienna Convention does clearly expand the geographical coverage of damage and leaves direct control with the Installation State; and while extending the definition of damage, it provides sufficient caution to the laws of the Installation State. How does this impact UAE?

The Vienna Convention has directed to insure damages or loss ranging from that of life, health and property so far. However, in case of any damage other than the specified ones, compensation would be provided as per the orders of the court (usually Installation State).⁶⁷⁵ For example, in case of any damage(s) to tourism and fisheries that does not include any kind of loss or harm to human life or physical property, cover may not be provided by the operator. Moreover, in the case of ‘rumour damage’ i.e. the losses which do not hold any proof, but are still claimed by the victim, this is an issue which is not addressed by the Convention. The UAE government and concerned authorities must consider this matter.

m. In the Gulf region, is there need for a neutral tribunal for settlement of claims?

At the moment, Law 4 of 2012 and the Vienna Convention are the legislations that cover the issues pertaining to nuclear liability. The court in UAE shall be responsible for deciding on matters relating to nuclear liability, however it might be a cause for concern as UAE is surrounded by several other countries and any kind of damage that occurs in UAE could potentially have an impact upon several nations, thus a neutral tribunal might prove to be essential.⁶⁷⁶

n. Many significant countries like UK and France are not signatories to the Joint Protocol and are not linked to Vienna Convention parties by treaty system. Are there any problems for the UAE or gulf region or Middle East if they do not ratify?

⁶⁷⁵ Official B (FANR, 20-08-2013).

⁶⁷⁶ Official A (FANR, 20-08-2013).

For the UAE, the technology to develop nuclear power plants on its own is limited; the assistance of several countries has to be sought if nuclear power is to be developed.⁶⁷⁷ One of the preconditions for assisting the UAE is that the country has to ratify the treaties - without ratification it might not be possible for UAE to legitimately develop nuclear energy. Moreover, since UAE is committed to using nuclear energy for peaceful purposes, it is also committed to ratifying the treaties.

o. How will the compensation to residents of a non-contracting party be handled, if there is any (nuclear) effect on the Gulf State or Middle Eastern State, because some of them are not contracting parties?

The liabilities both joint and exclusive should be accepted by the parties involved.⁶⁷⁸ In fact, the UAE is likely to rely on the IAEA introductory text which states:

“Like the principle of strict liability, the principle of exclusive liability of the operator facilitates the bringing of claims on the part of the victims of a nuclear incident, since it relieves them of the burden of proving the liability of parties other than the operator. But the principle also obviously favours the manufacturer, supplier or carrier of the material or equipment, since it obviates the necessity for them to take out insurance, as well as any other person who may have contributed to the nuclear incident.”⁶⁷⁹

p. How is the UAE going to manage liabilities stemming from accidents that may arise from the nuclear plants?

The UAE will manage liabilities stemming from accidents that may arise from the nuclear plants by applying its nuclear energy laws, which have been enacted in compliance with international legal instruments.⁶⁸⁰

⁶⁷⁷ Official A (FANR, 20-08-2013).

⁶⁷⁸ Official C (FANR, 20-08-2013).

⁶⁷⁹ IAEA introductory text

⁶⁸⁰ Official C (FANR, 20-08-2013).

q. What considerations, if any, are given to the potential liability of nuclear operators, (a strict liability approach)?

The nuclear operators would be responsible for potential nuclear damages. This is considered to be a strict liability approach. This is the main reason for the enactment of Decree No. 4 of 2012 Concerning Civil Liability for Nuclear Damage.⁶⁸¹

r. Who is going to be liable for any nuclear accidents arising from the proposed UAE's nuclear energy programme?

The operator, overseen by ENEC, would be liable for any nuclear accidents arising from the proposed UAE's nuclear energy programme.⁶⁸²

s. In a situation where damage occurred to a nuclear shipment whilst it was out of the source country and on its way to the destination country (damage in transit), who will remain liable for any damage?

The transporter would be responsible for any damage in transit as soon as the wastes are taken from the source country. This is in line with provision of the Vienna Convention.⁶⁸³

t. What jurisdiction would apply in case of third party liabilities/operator's liabilities?

The UAE Federal Law Decree No. 4 of 2012 would apply in case of third party liabilities and operator's liabilities.⁶⁸⁴

Huge insurance cover was noted to be the main issue in the UAE's nuclear power project plans. The nuclear power operator requires an enormous insurance policy. According to some respondents, the insurance issue was seen to be an obstacle to the development of nuclear power in the UAE, while others opined that huge insurance cover is in fact a

⁶⁸¹ Official B (FANR, 20-08-2013).

⁶⁸² Official A (FANR, 20-08-2013).

⁶⁸³ Official A (FANR, 20-08-2013).

⁶⁸⁴ Official B (FANR, 20-08-2013).

necessity, owing to the severe nature and effects as a result of nuclear accidents. However, those associated with the approval and running of nuclear power projects opined that in order to adhere to the international standards of safety and practices, it is necessary to fix the insurance policy requirement at a high amount.⁶⁸⁵

The law relating to nuclear damage in the UAE was formulated in line with the Vienna Convention on Civil Liability for Nuclear Damage and was ratified by the country's President, Sheikh Khalifa on August 13, 2012. The officials have also described the law as being in line with international best practices.⁶⁸⁶ The law states that all claims against nuclear power operators have to be made through the federal court.⁶⁸⁷

Although this is normal in a sovereign state, the researcher views that there may arise situations whereby the decisions of the federal court are skewed in favour of the government, since it is also the government which is responsible for operating the nuclear power plants. As the federal court is constituted by the government, there is likelihood of ensuring that the court's loyalty to the government is maintained. In this situation, what then is the fate of the victim of a nuclear accident? In other words, the influence of government in the claims decisions cannot be overruled.

According to the law relating to nuclear liability, the operator is liable for injuries caused by the nuclear activity arising from the nuclear reactor for which he holds the licence. The claim for damages needs to be filed before three years elapse from the date of the injury or from the date on which the sufferer ought to have known about the injury. Injuries that relate to life or person(s) can be claimed within thirty years of such injury. The UAE law provides that the operator will be exempted from the liability, if the injury caused by nuclear activity was the result of negligence on the part of the injured, or if it was caused by an act of the injured carried out with the intention to cause damage. The court can partly or fully exempt the operator from such liability.

There are several other exemptions to the liability of the operator when the supplier or person(s) working under contract has acted or committed to act with intention to cause

⁶⁸⁵ Officials B and C (FANR, 20-08-2013).

⁶⁸⁶ Officials B and C (FANR, 20-08-2013).

⁶⁸⁷ UAE Federal Law Decree No. 4 of 2012.

damage. Such a provision is also available to any person who acts or omits to act with an intention to create damage. The operators in the above-mentioned cases can turn to such persons for liability caused to the operator by their action or omission. There are provisions that can be used by the nuclear operator to indemnify the loss suffered if the injury was caused by the wilful act or omission of the supplier or contractor, or any other person. These exemption provisions can also be made applicable in the UAE based on the 1997 Protocol.

The officials who were interviewed regarding the jurisdiction of courts on the issue of liability in a nuclear accident, said that the country wherein the nuclear accident took place, will have jurisdiction over the claims that arise from such accident.⁶⁸⁸ The limitation period for claiming the damage is restricted to three years from the time when the injured realises the injury.

If the claim is made after a lapse of thirty years from the time of injury, when the injury is that of life or person and, if the injury is that of any other nature, the limitation period is ten years. If the claim of the individual suffering from an injury caused by nuclear accident is based on an insurance policy or any other scheme, this limitation will not be applicable. The limitation is only in relation to the liability of the nuclear reactor's operator alone.

u. What are the financial arrangements in terms of the amounts to be paid to victims of possible nuclear accidents?

The set amount to be paid by the operator to the victims of a nuclear accident is 2.5 billion Dirhams.⁶⁸⁹ The compensation amount must not be more than 450 million SDRs.⁶⁹⁰ The UAE government is liable to pay for the excess amount.

However, there is no standard limit for the potential damage caused to the people and their environment. Therefore, as per the 'polluter pays principle', there must not be any

⁶⁸⁸ Officials B and C (FANR, 20-08-2013).

⁶⁸⁹ Official A (FANR, 20-08-2013).

⁶⁹⁰ Article 5 of the UAE Federal Nuclear Law Decree No. 4 of 2012 Concerning Civil Liability for Nuclear Damage.

limit for the compensation either. In this regard, the IAEA's Explanatory Test provides that the Vienna Convention has not determined a maximum liability limit for which the Installation State imposes unlimited liability amounts.⁶⁹¹

v. What is the time limit, if any, for liability?

According to the decree passed at the Vienna Convention, in case of:

- any damage caused to either human health or life, the time limit would be 30 years;
- other losses, the time limit would be 10 years.

Said declaration is also included in Law No. 4 of 2012.⁶⁹²

w. In the transportation of nuclear and related cargo, both the shipper handling the cargo and the owner holding title to the shipment bear responsibility for the safe transportation of the consignment to its destination. In the present instance, will the UAE government bear ultimate responsibility for ensuring the safe handling of the cargo?

It was ascertained that while handling nuclear and fissile material, all stakeholders share the responsibility for ensuring the safe transportation of the consignment.⁶⁹³ Hence, the shipper certainly bears a responsibility towards ensuring the safe delivery of the radioactive cargo and, in ensuring that no damage is caused to the consignment during its delivery.

x. What about liabilities in countries like India or South Korea, what impact does it have on UAE?

In the coming age, countries like China, South Korea, Japan and India are expected to invest heavily in acquiring nuclear hardware and technology. Unfortunately, none of these countries are seemingly bound by specific stipulations, limitations and conventions

⁶⁹¹ Official A (FANR, 20-08-2013).

⁶⁹² Official B (FANR, 20-08-2013).

⁶⁹³ Official B (FANR, 20-08-2013).

governing their use. Acquiring nuclear hardware and technology, including power stations entails huge investments in terms of finances; paying environmental costs; handling issues of waste; the fuel; addressing health concerns; addressing security and proliferation issues and the political fallout. All of this has international repercussions and dimensions to be considered.⁶⁹⁴

Both the IAEA and the IEA project that, as an increasing number of nations try to set up nuclear power stations on their territories, issues of nuclear liability and their adherence to existing treaties, obligations and conventions, will gain increasing prominence. Further, complying with all the various obligations and treaties in operation, while ensuring that compliance with the same is not detrimental to existing national laws of the individual countries, would also give rise to specific and new challenges, in terms of ensuring the safety of nuclear facilities.

y. What exactly amounts to a nuclear accident or incident?

Whatever the consequences of the event, a nuclear accident could be classified to constitute damage originating due to malfunction(s) of a nuclear nature.⁶⁹⁵ Hence, the 1997 Protocol aptly describes the parameters of such incidences to constitute nuclear damage, irrespective of the origins of such incidents. Such damage would also include other aspects if there is serious possibility of nuclear damage, and not just restricted to the actual damage caused. This is in addition to the explanations provided in the 1963 Convention, all of which nevertheless excludes a clear definition of what would constitute a ‘grave and imminent threat’, other than the fact that it could cause loss of life.

Any number of reasons could end up contributing towards a nuclear incident, ranging from issues related to mechanical malfunctions in nuclear installations, to simple human errors. Nevertheless, the extent of damage caused by such actions could be immense.

⁶⁹⁴ Official C (FANR, 20-08-2013).

⁶⁹⁵ Official A (FANR, 20-08-2013).

z. What is the limit, if any, for any compensation awards?

Information gathered showed it is the responsibility of the insurance company to decide on the limit of compensation awards.⁶⁹⁶

Regarding the issues of liability, it was discovered that the UAE law covering the country's first nuclear power plants has placed liability for damages strictly on the operators. One of the requirements for operating a nuclear power plant is that the operator should have over Dh2.5billion in insurance to cover any possible claims against it.⁶⁹⁷ On the issue of the operator having such a huge insurance cover, the officials in the ENEC do not feel that this is a huge constraint, but instead that having insurance is essential.⁶⁹⁸

A senior official said that according to the Vienna Convention, in the case of damages overseas, if the country is a signatory of the convention, the claimant should lodge their grievance with the Abu Dhabi federal courts.⁶⁹⁹ Such case(s) would be treated and possible outcomes duly implemented. Many had opined that the law was enacted following a re-evaluation procedure involving the IAEA, international consultants, as well as local stakeholders. "This new liability regime provides a clear and predictable process for the public and nuclear industry to deal with compensation for damages that may arise in the case of a nuclear accident."⁷⁰⁰ "The definition of a nuclear incident under UAE law is wide and varies from a nuclear plant accident resulting in loss of life, to environmental and financial damages".⁷⁰¹ According to the law, ENEC can take indemnity coverage from wherever in the world.

The higher compensation value was agreed to after thoroughly reviewing the insurance market and in light of the strict operating standards being followed. It is also part of the law, which specifically says that the claimants can make a claim without needing to establish neglect or any type of fault from the operator. A senior official said that this complies with the standard international principles on nuclear liability.⁷⁰²

⁶⁹⁶ Official A (FANR, 20-08-2013).

⁶⁹⁷ The UAE Nuclear Law.

⁶⁹⁸ See: The UAE Nuclear Law.

⁶⁹⁹ Official C (FANR, 20-08-2013).

⁷⁰⁰ Official B (FANR, 20-08-2013).

⁷⁰¹ UAE Federal Law Decree 4 of 2012.

⁷⁰² Official C (FANR, 20-08-2013).

6.3.1 Analysis of legal and liability issues

Considering that almost any nuclear accident has consequences extending well beyond the national borders of an individual country, the national laws governing the use and operation of a nuclear power plant are supplemented by a range of legally binding international conventions and treaties. Generally, the operator's liability is somewhat limited in scope and is usually adequately covered within the national laws of the individual countries and the international conventions and treaties. This translates to the individual country accepting major and ultimate responsibility for the operations of the nuclear power plant within its borders. In this regard, the UAE is a signatory to the IAEA's Vienna Convention on Civil Liability for Nuclear Damage, which has been ratified by the UAE earlier this year, with the agreement having been last amended in 1997 (see Appendix 8).

Domestic UAE law regarding this has been drawn up to be in alignment with the parameters recommended by the IAEA, towards ensuring that all aspects of the law ratified are in agreement with associated international obligations and treaties. The FANR has been deputed as the legal entity overseeing the laws within the UAE borders in this regard.

Generally, Law 4 dictates that in case of any major nuclear incident and associated damage, the civil liability arising from the same is exclusively handled either by the operator of the facility, or by the entity contracted to transport the nuclear waste. The relevant section of the legislation lays out the operator's liability in Article 2 of the 1997 Protocol. It explains the extent of the operator's liability in the event of a nuclear catastrophe and covers provisions for the transportation of nuclear waste overland within the UAE.⁷⁰³

Therefore, Law 4 states that the operator is wholly responsible for the consequences in the event of an incident occurring while transporting waste from one location to another. In this regard, it is also pertinent to note that 'nuclear damage' is not specifically defined, and is vague, to cover a range of possibilities consistent with the 1997 Protocol.

⁷⁰³ The UAE Law Decree No. 4 of 2012.

Therefore, this could include any number of possibilities, including fatalities; physical and environmental damages; economic losses; repair costs and expenses; and the magnitude of lost income opportunities, where the environment is dramatically and drastically altered by a specific action or incident. In the event of permanent damage, the operator is very much liable to accept responsibility, irrespective of the extent of responsibility of the operator in this regard.

Law 4 requires the operator to obtain adequate insurance towards covering the possibility of damage and restitution in case of a nuclear incident. General claims against damages can be filed within 3 years of the incident, after which the claim would not necessarily be entertained. However, exceptions do exist where there has been a loss of life or grievous bodily harm, wherein the claim can be filed within up to 30 years of its occurrence, or within 10 years for associated damages.⁷⁰⁴

In describing damages, it is assumed this includes instances where environmental damage is caused to the ecosystem and to the marine life, which extends to areas beyond and adjacent to the national and maritime borders of the UAE, irrespective of observable health risks. It is considered that only allowing for claims on incidents affecting areas inside the national borders of the country would be inadequate, since nuclear accidents inevitably affect far and beyond the national borders of the country itself. Nevertheless, the 1997 Protocol does not necessarily make any specific reference to environmental or marine damages, or curbs imposed on fishing or tourism because of an incident. Instead, such damage encompasses all aspects of lost economic opportunities and losses incurred. Nevertheless, specific provisions explicitly governing these aspects are not part of the laws of the UAE or the Vienna Convention.

Although the operator is handed significant responsibility in this regard, also enshrined in Law 4 is the proviso that a degree of protection and support is also due to the operator, in that the latter is not held fully and/or wholly responsible, materially or financially, for the consequences, if the damage has been as a result of the affected individual's personal actions and gross negligence. The operator is also not wholly liable if the individual has undertaken action specifically with the intention of causing grievous bodily harm.

⁷⁰⁴ The UAE Law Decree No. 4 of 2012.

Equipment and service providers are also offered protection and safeguards in that the operator has recourse to legal remedy if such provisions are agreed upon beforehand, while executing a contract, or if the incident is because of some deliberate action(s) on the part of certain individuals. In such instances, the operator has recourse to contractual indemnity against the supplier or the individual identified as causing the intentional harm and damage. As per the 1997 Protocol, such remedy may also be claimed from the UAE government, pending the availability of public finances.

Interviews with the officials concludes that civil claims would generally be heard in the courts where the legal bodies would have jurisdiction to decide on such matters, hence the location of the incident would determine the specific legal system which would be hearing cases corresponding to such instances. Generally, civil damages would only be entertained and implemented if the appellant files suit within three years of the incident.⁷⁰⁵

The appellant would lose all rights to claim any damages if a case is not filed within 30 years of an incident involving the loss of life, or within 10 years in other instances of damages.⁷⁰⁶ Nevertheless, it is to be noted that the Law of Decree would continue to support individuals claiming benefits against individual health insurance schemes, employee compensation programs or associated occupational disease schemes.

Multiple nuclear accidents as in Fukushima and Chernobyl have revealed that the true scale and nature of the damage caused in a nuclear accident is only brought to light over a long period of time, since damages incurred take an indefinite period to manifest their true costs. Nevertheless, the majority of treaties have recognised 30 years to be a reasonable time period for perceiving the real scale of the loss, in consideration of the fact that it is often difficult to identify the true range and extent of damage immediately after a nuclear mishap. Nevertheless, in this regard, it is very important that the claimant should file his deposition in the courts as soon as the situation has manifested clearly.

An associated aspect to be considered is the jurisdiction of the courts if the claimant is outside and beyond the political borders of the UAE. In this case, as per the provisions of

⁷⁰⁵ Officials A and C (FANR, 20-08-2013).

⁷⁰⁶ The UAE Law Decree No. 4 of 2012.

the Vienna Convention, it is agreed that cases and claims have to be filed in the UAE federal courts if the claimant's country of origin is also part of the Convention.

Gathered data revealed that the UAE had undergone many discussions, negotiations and study on the issue of claims and liabilities.⁷⁰⁷ Accordingly, the law relating to nuclear liability in the country is clear on the issues of claims and liabilities and makes it possible for anyone involved in the UAE's nuclear liability regime to forecast the result of a claim. The law relating to nuclear liability was finally accepted after discussions with the IAEA and extensive international consultations with stakeholders. The officials are therefore confident about the clarity of nuclear liability regime in the country.⁷⁰⁸ The definition of nuclear damage also allows the operator to get the insurance coverage from any country and does not limit it to insurance companies within the UAE. The researcher sees this as a welcome move, as the operators are given a wider range of choice to pick out the insurance policy.

Apparently, a good deal of debate was made regarding the strict liability principle being applied to nuclear accidents. Senior officials of the UAE nuclear power plant rather preferred that the applicable strict liability principle is that which does not require the claimant to prove operator fault; this is in line with international instruments and provisions on liability arising from a nuclear accident. This argument renewed UAE authorities' commitment to adhere to the international standards. The author therefore maintains that since injuries from nuclear accidents are unconstrained and their effects incalculable, it is difficult to prove the cause and effect of such nuclear injuries, thus it can be discouraging to claimants.

It is envisaged that the nuclear laws and policies of the UAE have been formulated circumspectly, after numerous consultations and will help the country attain a safe, transparent and secure system of nuclear power development. There are various standards that have been enshrined in the laws and policies. These standards emphasise key principles which include: comprehensive operational clarity; the premier principles of non-proliferation; standards of care and security; working directly with the IAEA and

⁷⁰⁷ Official A (FANR, 20-08-2013).

⁷⁰⁸ Officials A and C (FANR, 20-08-2013).

conforming to its standards; co-operating with other nations, as well as ensuring long-standing sustainability.

According to international practice, it is the operator of the nuclear power reactor who is solely responsible for injuries caused by the reactors⁷⁰⁹. The strict liability principle only requires a relationship between the nuclear accident and operator flaw. It is not necessary to show that such injury is caused by the operator's fault. Therefore, it is expected that the nuclear operator takes all possible measures to evade a nuclear reactor leak or mishap. The international instruments thus necessitate the license holder be very careful to avoid pecuniary claims by the victims.

Except in certain circumstances, the operator of a nuclear reactor is the only person who can be made liable for the mishaps that ensue from the nuclear reactor for which he holds the license⁷¹⁰. These exemptions are only when there is armed conflict, aggression, war or rebellion. Other contractors or suppliers of nuclear reactive materials or any other person involved in the working of the nuclear power reactor are not made liable for the damage caused by nuclear accidents⁷¹¹. This is the reason why the operator is obliged to take out a huge insurance cover. This is to equally help in providing remedy to claimants.

Unlike other accidents, nuclear accidents have trans-boundary effects. These can pose various concerns to nations outside the boundary of the country where a nuclear plant is situated. This necessitates each country adopting the international Convention on civil liability for nuclear damage.

According to the respondents, by making the nuclear reactor's operator nuclear solely responsible for injuries caused by the nuclear reactor, more contractors and suppliers have become involved in the operation of nuclear reactors, on the understanding that they cannot be made liable for any injuries caused by reactors.⁷¹² Apropos the fact that the sole liability for nuclear damage rests on the operator who is covered by insurance and the

⁷⁰⁹Nathalie L. J. T. Horbach and P. Blanchard, "Responsabilité civile nucléaire des transports internationaux: Questions nouvelles et propositions", ("Civil nuclear liability in the transport of international materials: New questions and propositions.") RDAI, n 5, 2006, p.633.

⁷¹⁰Reece. R et al, op.cit.

⁷¹¹Julia A. Schwartz, *International law and Civil Nuclear Liability after Chernobyl* (OECD, 2006), published at www.nea.fr/html/law/chernobyl, Last Accessed at January 9, 2014).

⁷¹² Official C (FANR, 20-08-2013).

limitations, if any, are in tune with the national and international instruments, such a provision would entitle the state to be involved in the liability scenario as is the case in all other sectors. The most important international instrument that deals with the international nuclear regulatory regime is the IAEA's Vienna Convention on Civil Liability for Nuclear Damage, amended in 1997, which the UAE has formally ratified.

According to Heffron, R. J. et al (2016), it is possible that an accident within the nuclear sector may unavoidably surpass the amount stated in the legal liability limit, however to what extent, will be determined by the description and the reaction to the accident. On the other hand, it is obvious that the issue of liability in the nuclear energy sector is not an exceptional question where accidents regarding the energy sector are considered. If anything, the sector is further along in the process of determining this issue than in other parts of the energy sector, for example, in the offshore oil and gas industry⁷¹³. Any injury caused to the international community by an act of state has to be compensated by that state and this is a legal principle.⁷¹⁴ Setting up nuclear power plants in the UAE is a state-conceived project, thus it cannot neglect the responsibility of compensating victims of mishaps caused by the nuclear reactors. It is doubtful as to what extent the state can avoid such liability even if another individual has been given the license to run the nuclear reactor. There are various international instruments that deal with the responsibilities of the state towards the international community.

One aspect that many of the respondents forgot to mention was the issue regarding terrorism. The Middle East being a very sensitive area, is prone to terrorist attacks. Yet, the Conventions exclude acts of terrorism, armed conflict, hostilities, civil war and insurrection. It was essential that Law No. 4 of 2012 take this fact into consideration, especially since the Middle East is a volatile area and especially given the recent Arab spring uprisings, the threat could be more of an issue.

Provisions of the Vienna Convention allow for the installation state to have whole, complete and exclusive jurisdiction over a case where the incident has originated. This

⁷¹³Heffron, R. J., Ashley, S. F. & Nuttall, W. J. (2016). The global nuclear liability regime post Fukushima Daiichi. *Progress in Nuclear Energy*: Vol. 90, pp 1-10. [Online]. Available from: <http://www.sciencedirect.com/science/article/pii/S0149197016300415> Accessed on 21-05-2016.

⁷¹⁴ Draft Articles on Responsibility of States for Internationally Wrongful Act, G.A. Res. 56/83, Annex Art. 1, U. N. Doc. A/RES/56/83 (Dec. 12, 2001)

prevents the claimant from trying to implement the national laws of his own country determining and imposing upon the outcome of a petition. This provision is also applicable in cases where a carrier causes an incident outside the political boundaries of the country of origin and, is an important aspect of Law 4 of 2012 towards limiting the UAE's liability.

Legal systems where claims should be filed in the source country are a disadvantage to under-privileged claimants. This makes it important that the claimant should have recourse to a justice system which is impartial and not inclined to favour the economically stronger nuclear state or the financially stronger state against which the claim is being filed and brought forward. Implementing this aspect would be consistent to the IAEA's recommendation in that claims be heard in a non-discriminatory environment and all victims have unbiased and equal recourse to legal remedy against their claims. Nevertheless, the current situation of claimants being forced to process their petitions exclusively through the UAE justice system could be considered discriminatory and disadvantageous to the petitioner, to an extent.

The Declaration on Environment and Development; the Convention on the Law of the Sea; the Convention on Biological Diversity and the International Court of Justice have laid down guidelines concerning the accountability of States on the use of nuclear active substances. The Convention on Environmental Impact Assessment deals with the cross-boundary issues of conducting nuclear activities⁷¹⁵.

Before embarking on nuclear power projects, every nation shall assess the consequence of such power plant on the environment⁷¹⁶. The transportation of nuclear active materials that could be used as fuel for nuclear power plants needs to abide by the Code of Practice on the International Trans-Boundary Movement of Radioactive Waste that was adopted in the year 1991⁷¹⁷. Even though the provision of the Code is not mandatory but merely recommendations, almost all the countries abide by such rules.

⁷¹⁵Convention on Environmental Impact Assessment in a Transboundary Context app. I (2) -(3), Feb. 25, 1991, 1989 U.N.T.S. 309.

⁷¹⁶Ibid. Convention on Environmental Impact Assessment in a Transboundary Context

⁷¹⁷ IAEA, *Code of Practice on the International Transboundary Movement of Radioactive Waste*, Gen. Conf. Res. 530, IAEA Doc. GC(XXXIV)/RES/530 (Sept. 21, 1990).

During the interview, the authorities of the UAE said that there were various discussions held with the IAEA. It was also pointed out by the authorities that the IAEA legal team had studied the policy and been positive the policy was in tune with the agency's guidelines and other international instruments. The UAE's FANR is the authority executing the law.

Law 4 provides for some exemption in the case of an injury due to the nuclear activity or accident in a nuclear plant.⁷¹⁸ In all other cases however, the nuclear reactor operator is made liable. According to Article 2 of the 1997 protocol, the liability of the operator includes injury caused by a nuclear accident including if the injury is caused while transiting a nuclear active material in and out of the nuclear plant.⁷¹⁹ As per the UAE law, the operator is liable for the injury caused by the nuclear plant exclusively. The meaning of the term 'nuclear damage' under the 1997 protocol is wide-ranging and it deals with injury to person and property, monetary loss and loss caused to the environment. The UAE follows the Vienna Convention regarding environmental issues. However, the convention is limited to costs of reinstatement. The subparagraph is silent as to compensation where replacement is not probable. This is the case with extensive fault, predominantly of the aquatic setting.⁷²⁰

Another legal issue that arises in the international arena when a country ventures into the nuclear field is the misuse of nuclear active materials. The Treaty on Non- Proliferation of Nuclear Weapons (see Appendix 13) has reduced the fear of the international community regarding the use of nuclear active materials for destructive purposes. The NPT also led to various issues amongst the nations⁷²¹. The fate of Iran is one of the effects of the NPT was used by the powerful nations with some ulterior motive⁷²².

In order to erase the international community's fear regarding the misuse of nuclear active materials, the UAE ratified the NPT. According to the officials, the UAE was committed

⁷¹⁸ The UAE Nuclear Law.

⁷¹⁹ Article 2 of the 1997 protocol.

⁷²⁰ The Vienna Convention.

⁷²¹ The Embassy of the United Arab Emirates in Washington DC, Available at <http://www.uae-embassy.org/uae/foreign-policy/non-proliferation> , Last accessed on 01-07-2012.

⁷²² Ibid. The Embassy of the United Arab Emirates in Washington DC,

to eliminating the international community fears over the use of nuclear active materials for destructive purposes⁷²³.

According to the officials, the UAE is fully aware of the consequences of using nuclear active materials for destructive purposes.⁷²⁴ The officials also were of the view that UAE was against the dangers caused by unethical use of nuclear active materials. According to the respondent(s), the UAE's intention is aimed at only producing the electricity required for fulfilling the country's needs and as such, the country has been particularly open in making the whole process transparent to the international community⁷²⁵. The view expressed by the official was that the UAE is against the use of nuclear active materials for destructive use⁷²⁶. The country seems to be aware of the need for improving the Middle East's reputation in relation to terrorism and other extremist activities.

The UAE accepted membership of the IAEA which shows the country's intention in fighting against the use of nuclear active materials for destructive purposes⁷²⁷. The country has also joined hands with other nations to fight against nuclear terrorism. Thus, the international community can be sure about the motives of the country as it begins stepping into the nuclear field and can be assured of the fact that only peaceful use of nuclear active materials is on the agenda⁷²⁸. The UAE also fought against the use of mass destructive weapons, which were allegedly accumulated by Iran⁷²⁹. Therefore, the issue of misuse of nuclear active materials need not be raised in the case of the UAE, based on their adherence to the internationally accepted standards of nuclear reactors.

The dumping of radioactive wastes is another issue faced by the UAE. Many of the countries try to dispose of the nuclear active wastes within their boundaries, but in certain cases there are instances of transporting such materials to another country, or at least

⁷²³ Officials A and C (FANR, 20-08-2013). Ibid. The Embassy of the United Arab Emirates in Washington DC,

⁷²⁴ Officials B and A (FANR, 20-08-2013).

⁷²⁵ Official B (FANR, 20-08-2013). Ibid. The Embassy of the United Arab Emirates in Washington DC.

⁷²⁶ Officials B (FANR, 20-08-2013). Ibid. The Embassy of the United Arab Emirates in Washington DC.

⁷²⁷ Ibid. The Embassy of the United Arab Emirates in Washington DC.

⁷²⁸ CRS Report RL33865, (2003). *Arms Control and Non-proliferation: Catalogue of Treaties and Agreements*, by Amy F. Woolf, Mary Beth Nikitin, and Paul K. Kerr. The UAE has had an IAEA safeguards agreement in force since 2003. Available at: <http://www.iaea.org/Publications/Documents/Infocircs/2003/infocirc622.pdf>.

⁷²⁹ Ibid. CRS Report RL33865, 2003.

beyond its geographical boundaries. The ecological balance is known to be disturbed when radioactive materials are dumped in the high seas⁷³⁰.

The Convention on the Prevention of Marine Pollution by Dumping of Wastes stipulates that the license holder of the nuclear reactor is responsible for handling the nuclear active wastes from the reactor. The duty of supervising the reactor operator is cast on the State by the Convention⁷³¹. The UAE needs an agency within the country to monitor the license holder and it should also make provisions for issuing licenses to those in charge of disposal of nuclear active wastes.

Above all, the respondents reiterated that as a Member State, the UAE in its desire to maintain highest standards in the nuclear power programme, takes on board the 19 milestones for nuclear power infrastructure development (2007) as outlined by the IAEA. It is believed that with special attention paid to these milestones, it is possible that to a considerable degree many hazards could be reduced in the development and operation of the country's nuclear power programme.

The aim of the UAE is to yield power through nuclear energy to fulfil the growing needs of the country's industrial sector. This aim is reasonable when compared to those countries which use it for reinforcing their armed forces. The early planning of the country is notable. The necessity for clarity in nuclear dealings is a significant factor to be followed by all the international entities that use nuclear energy. That example can be followed by other international entities.

6.4 Political issues

These discussions are generally focused on the political decisions leading to the development of the nuclear energy programme and consideration of any future developments and plans for dealing with any problems that may arise.

⁷³⁰ Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter Annex I (6), Dec. 29, 1972, 1046 U.N.T.S. 120, 26 U.S.T. 2403.

⁷³¹ Ibid Article 21.

a. How would you rate your knowledge and understanding of the UAE nuclear energy programme?

The participants attested that their understanding of the UAE nuclear energy programme is great and interesting.⁷³² The UAE has been totally in compliance with all IAEA directives regarding its nuclear programme and policies. This is amply demonstrated by how the IAEA has conducted an Integrated Nuclear Infrastructure Review mission (INIR) in 2011 within the UAE, to assess the UAE's nuclear initiatives. On the conclusion of the tour, IAEA officials certified the UAE's complete compliance with all IAEA directives, including the 'Milestones' approach, all of which is uploaded on the IAEA website.

The IAEA also conducted an Integrated Regulatory Review Service Mission (IRRS) in 2011, for the UAE to appraise itself of the FANR regulated activities conducted by the country, which was also intended to understand the safeguards incorporated within the system being mindful of the TEPCO Fukushima Daiichi Nuclear Power Station debacle.

The INIR studies encompass all aspects related to the construction of nuclear power plants. Once member states file an application for review, a team of international experts is assembled and reviews all paradigms associated with the applicant's programme. In consideration of the country's internal review and assessment, the IAEA team itself undertakes a thorough review of the entire project and personally interviews and assesses viability and feasibility. On conclusion, weak areas are highlighted and corresponding correction measures and actions are recommended.

b. What is the UAE's involvement in the management of the nuclear plants in terms of funding and management?

The UAE government funds the nuclear programme; government departments like ENEC will be responsible for managing the programme, while FANR issues the licence as well as the regulations concerning the nuclear programme.⁷³³ The licence application for the nuclear reactor was enormous and required a large team of about sixty persons from the

⁷³² Officials D, and E (FANR, 20-08-2013).

⁷³³ Official D (FANR, 20-08-2013).

FANR to monitor and evaluate the application. The review team also had persons from three consulting firms.

The official maintains that as the premier UAE nuclear regulatory watchdog in the country, the agency undertook an 18-month review of all aspects of the proposal submitted by the ENEC, besides satisfactorily fielding some 1600 queries from the regulator. Furthermore, a permanent and revolving review and compliance board would be established at Baraka, some 300 km west of Abu Dhabi.⁷³⁴ To support and execute the initiative, about 5000 workers from 10 nations have already settled at the site, with directives and signs posted all around in various languages, especially English, Arabic and Korean.⁷³⁵ “Some 600 cubic meters of concrete are expected to roll out of a batch plant installed on-site, which is currently utilised to construct at least two workers villages before subsequently progressing to providing concrete for the foundations of the project”.⁷³⁶

c. Why did ENEC select KEPCO and the Advanced Power Reactor 1400 MWe (APR1400) for its programme?

The official said that the reason ENEC selected KEPCO for its nuclear programme was based on the company’s affordability and training of indigenous personnel compared with the American and European companies. The Advanced Power Reactor 1400 MWe (APR1400) is economical and easy to run. It is also a third generation and environmentally friendly.⁷³⁷

d. How will the UAE’s nuclear power plant operate?

The nuclear power plant in Abu Dhabi will be operated by ENEC with KEPCO.⁷³⁸ The Advanced Power Reactor 1400 MWe (APR1400) is economical and easy to run.⁷³⁹ It is

⁷³⁴ Official E (FANR, 20-08-2013).

⁷³⁵ Official D (FANR, 20-08-2013).

⁷³⁶ Official D (FANR, 20-08-2013).

⁷³⁷ Official F (ENEC, 20-08-2013).

⁷³⁸ Official F (ENEC, 20-08-2013).

⁷³⁹ Safety design features in the APR1400. [Online]: Available at: https://www.google.co.uk/search?hl=en&site=imghp&tbm=isch&source=hp&biw=1024&bih=676&q=jelly&oq=jelly&gs_l=img.1.1.0110.11391.20688.0.24563.7.6.1.0.0.0.218.624.5j0j1.6.0....0...1ac.1.31.img..0.7.609.3yDPcVt-0sw#hl=en&q=safety+design+features+in+the+APR1400&tbm=isch&imgdii= Accessed on 04-12-2013.

also a third generation and environmentally friendly. It is a pressurised light water reactor with capacity of 1,400 MW. Its design life time is 60 years, with the seismic design basis of SSE 0.3g.⁷⁴⁰

KEPCO will also help to develop the local skills and talents of the UAE's citizens to be utilised in developing the power generation programme of the UAE⁷⁴¹. According to ENEC publication, the contract for the development of nuclear power plants "call[s] for extensive training, human resource development, and education programs as the UAE builds the capacity to eventually staff the clear majority of the nuclear energy programme with national talent. The KEPCO team is a dedicated and highly experienced team to our project and has shown a serious commitment to transferring the knowledge gained into the UAE programme."⁷⁴²

e. What are the levels of involvement of the USA and UK in the UAE's nuclear programme?

It was gathered that the USA and the UK have agreed to co-operate with the UAE in the exchange of technical know-how toward a successful UAE nuclear power programme.⁷⁴³

An institute for the development of human resources and skill set in UAE nationals was to be formed by the UAE government with the co-operation of the Gulf Nuclear Energy Infrastructure Institute (GNEII), Sandia National Laboratories, the Nuclear Security Science and Policy Institute of the USA and the University of Khalifa⁷⁴⁴.

In order to succeed in the construction and running of the nuclear power plants, it is important that the labour force is well equipped with the much-required knowledge on every aspect of nuclear power plants, from the very lowest level to the highest level. Only if this knowledge is imbibed at all levels, can the nuclear programme be successful⁷⁴⁵.

⁷⁴⁰ See Safety design features in the APR1400.

⁷⁴¹ Emirates Nuclear Energy Corporation Press Release, December 27, 2009, op.cit.

⁷⁴² Ibid. Emirates Nuclear Energy Corporation Press Release, December 27, 2009, op.cit

⁷⁴³ Official E (FANR, 20-08-2013).

⁷⁴⁴ Official F (ENEC, 20-08-2013).

⁷⁴⁵ Official F (ENEC, 20-08-2013).

f. Does it really matter that communities in the region would be affected by building a nuclear plant near them?

The officials said that all the communities in the region have been informed about the building of a nuclear power plant near them and have been duly consulted. The UAE has educated the society about the concerns of nuclear plants.⁷⁴⁶

g. Will the UAE be re-processing or enriching fuel?

The officials said that UAE will not be re-processing or enriching fuel. The country has agreed with the international community not to venture into these practices.⁷⁴⁷

h. To what extent would you agree that the UAE should decide not to enrich or re-process used fuel?

Presently, the country is not interested in enriching or reprocessing Uranium used fuel, only in the peaceful use of nuclear materials.⁷⁴⁸

i. What are the plans for the local people where the plants are located?

The plants will be established in the non-inhabited areas and it is also envisaged that the nuclear plants will be radiation free. The government plans to always orientate the local people on issues concerning the nuclear programme.⁷⁴⁹

6.4.1 Analysis of political issues

The UAE's nuclear energy policy aims at ensuring operational transparency and non-proliferation and these will be achieved through genuine commitment to the good management of its nuclear programme.⁷⁵⁰ The country's choice of the nuclear power

⁷⁴⁶ Official F (ENEC, 20-08-2013).

⁷⁴⁷ Official D (FANR, 20-08-2013).

⁷⁴⁸ Official D (FANR, 20-08-2013).

⁷⁴⁹ Official D (FANR, 20-08-2013).

⁷⁵⁰ The Policy of the UAE on the Evaluation and Potential Development of Peaceful Nuclear Energy.

programme followed an all-embracing nationwide consultative process and determination to comply with detailed requirements to enhance safety and security.

The IAEA recommends that all nuclear states perform their responsibilities to nuclear safety. Therefore, the UAE policy on nuclear energy is anchored on the highest possible standards of safety and security. To achieve the above, the following should be significantly considered:

The researcher suggests that the UAE should meet the IAEA principles and promise the utmost dogmatic standards by ensuring that stipulated procedures are followed and maintained as well as considering the enacting of national regulations to also guide nuclear processes.

Also, the country should establish a tradition of safety that pervades and persuades resolutions as well as accomplishments of all the programme's stakeholders. Developing local, sustainable human resources will encourage the nuclear programme. Here, human capacity and manpower development become important for the running of the nuclear plant(s).

The author equally proposes that the UAE should build robust 'risk aware' security arrangements to protect plants and facilities. This ranges from standardised building of every facet of the plant, as well as clamping down on external threats. The country should plan for long term decommissioning, which involves careful and systematic complete closure of non-functional nuclear plants.

6.5 Economic issues

These analyses and discussions are generally focused on the economic decisions leading to the justification and rationale for the development of the nuclear energy programme in the UAE.

a. Why did the UAE decide to pursue nuclear energy?

The official said that the UAE's decision to pursue nuclear energy was informed by the need to improve the local economy and research development in the area; and added that nuclear energy is safer and economical if used for peaceful purposes and follows pre-set conditions.⁷⁵¹

The development of the nuclear power projects will benefit the UAE economically and the mass generation of power in the country would help in the development of commerce which will in turn increase the GDP rate of the federation.⁷⁵²

According to the official, the demand for more energy happened during a period of huge industrialisation and it was realised that after some years, energy generation through conventional methods would not be able to cater for the growing needs.⁷⁵³ It is important to ensure that the UAE's electricity generation should be sufficient to meet prospective demand.⁷⁵⁴ For this reason, there was necessity for expansion, through nuclear power generation.

b. How does nuclear energy compare to other sources of electricity in terms of fuel efficiency, cost and stability?

The official pointed out that nuclear energy is economical, safer and environmentally friendly compared with other sources of energy; hence the cost of nuclear power is competitive and stable and uranium is limitless. It is found everywhere and could be recovered from sea water when dissolved.⁷⁵⁵

The UAE has contracted to the supply of natural gas to Japan⁷⁵⁶. Petroleum reserves may not be sufficient to produce the massive demand for energy and it is also not encouraged, due to the adverse effects on the environment⁷⁵⁷. There is a low reserve of coal in the

⁷⁵¹ Official G (FANR, 22-08-2013).

⁷⁵² Official H (ENEC, 22-08-2013).

⁷⁵³ Official G (FANR, 22-08-2013).

⁷⁵⁴ "Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy," Released April 20, 2008. Available at: <https://pcs.enec.gov.ae/Content/Home.aspx>, last accessed on 3-01-2014.

⁷⁵⁵ Official G (FANR, 22-08-2013).

⁷⁵⁶ Middle East Economic Digest, "UAE purchases gas from Dolphin pipeline at reduced rate," May 16, 2008. For more information on the pipeline, see http://www.oxy.com/Our_Businesses/oil_and_gas/Pages/og_mena_dolphin.aspx last accessed on 3-1-2014.

⁷⁵⁷ Christopher Blanchard M. et al, op.cit.

UAE and it was not found feasible for power generation⁷⁵⁸. Although wind and solar energy productions are also useful, they could not produce electricity in high capacity. Based on the above reasons, the UAE consented to nuclear energy as the best possible source for energy production to meet the needs of 2020.⁷⁵⁹

c. How does a nuclear energy plant produce electricity?

The official said that a nuclear reactor produces and controls the release of energy from splitting the atoms of uranium and uranium-fuelled nuclear power is a clean and proficient means of steaming water to drives turbine generators.⁷⁶⁰ A nuclear power station works like most coal or gas-fired power stations, except for the reactor itself.⁷⁶¹

The power generation through nuclear energy is made possible through various nuclear reactors set up with the help of innovative methods to ensure safety and security⁷⁶².

d. How will the host communities benefit economically from this nuclear power plant?

Data gathered indicated that the local communities will essentially gain extra energy with least cost and this affordability would help promote economic development in the local communities.⁷⁶³

Nuclear power generators will provide more employment opportunities to the nationals of the UAE. This can help the country achieve a better economic position⁷⁶⁴.

e. Is there an expanding plan for nuclear energy stations in other cities?

⁷⁵⁸ Ibid. Christopher Blanchard M. et al, op.cit.

⁷⁵⁹ Official H (ENEC, 22-08-2013).

⁷⁶⁰ Official H (ENEC, 22-08-2013).

⁷⁶¹ Official H (ENEC, 22-08-2013).

⁷⁶² Ibid. Christopher Blanchard M. et al, op.cit.

⁷⁶³ Official H (ENEC, 22-08-2013).

⁷⁶⁴ Official G (FANR, 22-08-2013).

The official said that the UAE plans to expand the nuclear power projects to other cities.⁷⁶⁵

f. Is there a detailed cost-benefit plan devised to support the arguments for the development of nuclear energy?

The official said that the UAE will sell electricity to the Gulf region and the African countries.⁷⁶⁶

6.5.1 Analysis of economic issues

This section presents an analysis of the economic issues concerning nuclear energy development in the UAE, about which information was collated during interviews with officials at FANR and ENEC. It also looks at the discrepancy with the IAEA's laws and the nuclear law of UAE in this regard.

The UAE intends to use nuclear power generation programmes to suit the economic purposes of the country and improve local economies. Nuclear power is economical and stable. The author posits that the use of skilled labourers from other nations in the UAE nuclear power projects will benefit the economy and foreign exchanges of other nations. Thus, the nuclear power project conceived by the UAE will benefit the country, catering for its power needs and simultaneously will benefit other nations through having their skilled labourers working in the UAE.

On the other hand, the growing population of labourers from other nations has affected the growth of national skilled labourers from within the UAE. This would in turn result in labourers from other countries monopolising the nuclear power project. The lack of national skilled labourers will eventually affect the work culture and workforce in the country. This needs to be addressed, if the UAE wants to provide more employment opportunities to its own nationals.

⁷⁶⁵ Official H (ENEC, 22-08-2013).

⁷⁶⁶ Official H (ENEC, 22-08-2013).

The generation of electricity through conventional methods would have increased the opportunities for low skilled, medium skilled and high skilled labourers⁷⁶⁷. The ENEC's objective was to increase the participation of the local inhabitants in the building of the nuclear power generators⁷⁶⁸. Extensive training, human resource development, and education programmes are required for the UAE to build enough competence to run the nuclear energy programme with local endowments.

The researcher argues that although the country has set up a training institute to impart knowledge and skills to the indigenous population and the local labourers, it is a highly expensive procedure, because the training of individuals relating to nuclear reactors cannot be confined to classroom teaching and requires practical expertise. This would lead to increase in expenditure for the country. When the cost-effective analysis regarding the employment opportunities is conducted, the training costs involving the idea of imparting technical and scientific expertise to the indigenous population needs to be seriously thought out.

The Federal regulation of UAE in Clause (7), defines nuclear damage as any other economic loss, other than loss caused by the impairment of the environment.⁷⁶⁹ However in the IAEA's amended regulation, there is a statement, if permitted by the general law on civil liability of the competent court. Whatever the case, the author views that any economic damage should be duly compensated.

6.6 Safety, security and environmental issues

These discussions are focused on those aspects of the development and treatment of nuclear energy, with a specific view to the continuing assurance of safety for the communities served.

a. Are nuclear energy plants safe?

⁷⁶⁷ Official G (FANR, 22-08-2013).

⁷⁶⁸ Emirates Nuclear Energy Corporation Press Release, December 27, 2009.

⁷⁶⁹ The UAE Federal Law Decree No. 4 of 2012.

The official said that nuclear energy plants are safe only if pre-set conditions for their operation are strictly followed.⁷⁷⁰

b. Is it safe to live near to, or work within, a nuclear energy plant?

The official also said that it is safe to live or work within a nuclear power plant, because it is radiation free.⁷⁷¹

c. Who will license radioactive sources?

The officials said that FANR will be responsible for licensing radioactive sources.⁷⁷²

d. What are the safety design features in a nuclear reactor?

The official⁷⁷³ responded that safety designs in the APR1400 chosen by the UAE for its nuclear power programme possess Core Damage Frequency of less than 10-6/RY; Containment Failure Frequency of 10-6/RY; Occupational Radiation Exposure of 1 man-Sv/RY or less; Thermal Margin of 10% or higher; Station blackout Copping Time of 8 Hours minimum; and the Containment boiling of PS Concrete Structure.⁷⁷⁴

It was also gathered that in constructing the building which is ultimately slated to house the nuclear reactor, ENEC intends to pour in a total of around 1500 cubic meters of concrete for a foundation slab at the Barakah Unit 1 Reactor Containment Building.⁷⁷⁵ Generally, containment structures are amongst the safest construction endeavours in consideration of the thickness of their walls, the magnitude of steel used to reinforce the structures and the interior steel liner plate utilised during the construction process.

In the next phase, the concrete is intended to be poured into the reactor containment building, auxiliary and turbine buildings are intended to be constructed, besides raised

⁷⁷⁰ Official I (ENEC, 22-08-2013).

⁷⁷¹ Official I (ENEC, 22-08-2013).

⁷⁷² Official J (FANR, 22-08-2013).

⁷⁷³ Official I (ENEC, 22-08-2013).

⁷⁷⁴ Ibid. Safety design features in the APR1400.

⁷⁷⁵ Official I (ENEC, 22-08-2013).

cooling structures. The onsite fabrication and installation of the Reactor Building Containment Liner Plate would have commenced by the end of 2012, utilising heavy-lift cranes and equipment.

e. What will you do with nuclear waste - will it be stored?

The official said that UAE will store it in the country for 20 years, after which it will be removed using new techniques.⁷⁷⁶

f. How is the UAE going to transport waste from the nuclear plants?

The respondent said that the highest waste will be sent back to South Korea for treatment and reprocessing, to be imported again into the UAE.⁷⁷⁷ See the Diagram 10 below for illustration.

⁷⁷⁶⁷⁷⁶ Official J (FANR, 22-08-2013).

⁷⁷⁷ Official J (FANR, 22-08-2013).

Diagram 10: Nuclear material shipping line between UAE and South Korea



Source: China India Middle East Express, 2014⁷⁷⁸

g. Which country are the nuclear wastes going to be transported to?

It was gathered that the nuclear wastes will be transported to South Korea.⁷⁷⁹

h. How is the UAE going to manage environmental concerns arising from the nuclear plants?

The official said that the UAE's Department for the Environment will collaborate with the Department for Health to ensure that environmental concerns arising from the nuclear plants are well managed.⁷⁸⁰

⁷⁷⁸China India Middle East Express, 2014. Nuclear material shipping line between UAE and South Korea. [Online]: Available: <http://www.cma-cgm.com/products-services/line-services/flyer/CIMEX> Accessed on 16/09/2014.

⁷⁷⁹ Official I (ENEC, 22-08-2013).

⁷⁸⁰ Official I (ENEC, 22-08-2013).

i. What is the potential impact of nuclear materials in the marine environment?

It was gathered that if the marine environments are polluted by radioactive materials, there is some possibility of danger to marine lives and maritime crews.⁷⁸¹

j. How does nuclear energy compare with other energy sources in terms of environmental impact?

The official said that nuclear energy is less harmful and more environmentally friendly than other energy sources. In other words, nuclear energy helps to reduce carbon dioxide (CO₂) emissions during its processing.⁷⁸²

It was gathered that nuclear energy saves huge CO₂ emissions annually and helps in reducing the carbon footprint and that the ecological effects of nuclear power plants are not only limited to the emission of carbon dioxide, but also the emissions of radioactivity from nuclear active wastes.⁷⁸³

Proper disposal of nuclear active materials is a concern for the UAE, since the international conventions prohibit the dumping of such wastes in the high seas and it is also not encouraged to take such wastes beyond a country's geographical boundaries.⁷⁸⁴

k. What systems do you have in place in case of emergency?

It was gathered that presently, there are no systems in place in case of emergency, but there are plans in progress for the release of emergency systems in the year 2015.⁷⁸⁵

⁷⁸¹ Official I (ENEC, 22-08-2013).

⁷⁸² Official I (ENEC, 22-08-2013).

⁷⁸³ Official I (ENEC, 22-08-2013).

⁷⁸⁴ Official J (FANR, 22-08-2013).

⁷⁸⁵ Official I (ENEC, 22-08-2013).

I. Who is responsible for the security of the plants?

It was gathered that the UAE's Critical Infrastructure and Coastal Protection Authority will be responsible for the security of the nuclear plants.⁷⁸⁶ In addition, the country considers using the services of its joint security forces, which include the army and the police.

6.6.1 Analysis of safety, security and environmental issues

Officials at ENEC view safety as a primary concern. They mostly follow the guidelines that have been set by international organisations. These guidelines are often imbibed by other industries. They are constantly developing a safety culture at ENEC and their main concern is to ensure the safety of the UAE population, the workers, as well as that of the environment. At ENEC, staffs are expected to raise any issue relating to security and recognise areas for upgrading. Nuclear plants are safe to work in as they are known to be radiation free.

The researcher maintains that the liability covered by the law includes loss of or damage to property; cost of restoring the impaired environment; death and personal injury; loss of income because of such impairment; preventative measures; and any other economic loss caused by the accident. The nuclear law in the UAE provides for injury caused to person and property, as well as compensation for injury caused economically and ecologically.⁷⁸⁷

Licensing in the UAE nuclear industry is basically controlled by FANR. ENEC, to maintain safety in the UAE's nuclear plant considers improving on set standards during construction, by reinforcing the foundation slab and the reactor containment building.

Nuclear energy is environment friendly. Arguably, nuclear power entails the formation of waste products of changing levels of radioactivity, some of which will still present as

⁷⁸⁶ Official I (ENEC, 22-08-2013).

⁷⁸⁷ The UAE Nuclear Law Decree No. 4 of 2012.

dangerous thousands of years on⁷⁸⁸. The treatment of nuclear wastes will be by storage for a considerable number of years, then it will be transported for treatment and reprocessing, depending on the type of waste.

The UAE has a formidable environmental and public health department, which will ensure that related concerns are well contained. Emergency responses should be enhanced to cater for such issues when need arises. The UAE also considers the reduction of its carbon footprint up to 12 million tonnes annually.

6.7 Summary of Chapter Six

Chapter Six presents the analysis and discussions on the excerpts gathered during interviews with experts in the UAE, in the field of nuclear energy, using qualitative research methodology. This helped to explore issues relating to the UAE's possession of nuclear power. Using prepared and approved questions, different views on pertinent issues to do with the legal and liability, political, economic as well as safety, security and environmental aspects of the country's nuclear energy development were gathered. The research results are critically discussed.

While ensuring maximum requirements in the nuclear power programme, the UAE complies with international standards to ensure safety and security. As a member nation, the country seriously considers the 19 milestones for nuclear power infrastructure development. The country has also been successful in initialising the nuclear power project, with the assistance of the IAEA and their timely reviews. The country's nuclear policies have also attained a consensus from the international community. This is because the country's policy is viewed as transparent.

The UAE is party to the international conventions on nuclear safety including The Convention on Early Notification of a Nuclear Accident; The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency; and the comprehensive Convention on Nuclear Safety.

⁷⁸⁸Tromans, Stephen (2010). *Nuclear Law: The Law Applying to Nuclear Installations and Radioactive Substances in its Historic Context*. Hart Publishing: Oxford. Page 2.

UAE also collaborates with other nations which uphold peaceful use of nuclear active materials and have ratified the NPT to be accepted within the international community. The country's genuine need to mobilise its citizens to control the nuclear power plant is evident with the establishment of an institute to produce personnel in the fields of science and technology and particularly, nuclear power generation.

The UAE has also been seen to have gained vast experience from previous nuclear accidents that have happened in various parts of the world. The country places the utmost importance on the safety and security of its nuclear power plants, the inhabitants of the communities where the plants and the environment. UAE tries to staunchly abide by the international conventions and guidelines relating to the operation of nuclear reactors.

The UAE's nuclear policy has undertaken issues in the liability regime which is in line with international instruments, thereby making the operator fully responsible for the damage caused by nuclear accidents. The country also limits the period within which a claim for damages can be brought by the claimants.

CHAPTER SEVEN

CONCLUSION AND RECOMMENDATIONS

7.1 Introduction to Chapter Seven

Chapter Seven forms the Conclusion part of the thesis. Here, the researcher reviews the study, presents the original contributions that the research has made to the area of study and makes some recommendations on how the law can be used to determine issues regarding state and civil liabilities in the UAE's nuclear power programme. These recommendations are made based on the outcome of the research and are offered for the intensification of nuclear energy development in the UAE. This chapter therefore presents how the research aims and objectives have been met through the research process.

7.2 Highlights of the UAE's nuclear power programme

7.2.1 Motivations for UAE's nuclear power programme and its economic importance

The UAE has commenced its nuclear power programme, aimed at meeting the country's increasing demand for electricity. The programme benefits from the support of the IAEA and their regular reviews. The nuclear policies of the country have also achieved global acceptance having been viewed as being transparent. The author believes that the country has gained from the experiences of previous nuclear accidents and has paid utmost importance to the safety and security of the nuclear power plants, inhabitants and the environment. The country also abides by the international conventions and guidelines relating to nuclear reactors.

Undoubtedly, the use of nuclear energy for power production has increased the pace of development in many countries and has aided industrial development more than renewable sources of energy have. UAE plans to build about fourteen nuclear power plants. It will construct and run four nuclear plants by the year 2020. The country started the construction of the power plant in Abu Dhabi in collaboration with a Korean consortium (KEPCO). The company was awarded the contract after bidding along with

seven other companies. While UAE wants to possess nuclear energy to promote national development, the researcher also believes that the country weighed up possible constraints related to embarking on the programme.

The UAE was meticulous in maintaining the transparency in running the nuclear programme. To make this possible, the ENEC was formed. It was given the status of a public entity. The corporation was to evaluate the workings of the UAE's nuclear power programme. The development of the nuclear power plant in Barak was given the licence for construction by the ENEC. After the approval for the first site was obtained, the UAE was successful in getting the approval for building the other two nuclear power plants also. The commercial viability of nuclear power generation is useful for countries that expect tremendous development in the commercial arena.

The researcher argues that the distinctive nature of the risks created by leakages of radioactive materials significantly restricts dealing with eventual nuclear liability claims under the present state compensation laws. The UAE, having recognised this has structured its national law in compliance with the law of obligations contained in nuclear liability conventions and incorporates the fundamental principles included therein. These principles include the following:

- i. The operator of a nuclear plant being entirely and legally responsible for nuclear damage.⁷⁸⁹
- ii. Ascertaining the liability of the operator without the need to demonstrate negligence.⁷⁹⁰
- iii. Making sure the local courts in the place of incidence undertake exclusive jurisdiction of claim cases.⁷⁹¹
- iv. The possibility of setting a time limit for liability and the amount of liability.
- v. The payment of damage, devoid of bias or favouritism based on ethnic grouping or residence.

⁷⁸⁹ As contained in International Nuclear Laws example Vienna Convention etc.

⁷⁹⁰ See in particular *Callow v. Tillstone* cited from <http://e-lawresources.co.uk/Strict-liability.php> Accessed on 13/04/2013.

⁷⁹¹ See http://www.iaea.org/Publications/Documents/Conventions/liability_status.pdf+ Accessed on 18/05/2013.

7.2.2 Safety and non-proliferation of nuclear materials

The UAE's objective to produce power through nuclear energy to meet the needs of the country seems to be an incredibly justifiable use of nuclear power. This is unlike many countries that use it to strengthen military forces. The UAE's approach towards the use of nuclear energy is another factor that needs appreciation and appears to be a model for other countries. The need for transparency in nuclear dealings is an important factor to be adopted by all international entities that use nuclear energy.

The international community has apprehensions about more states possessing nuclear energy, especially after the nuclear accidents in power plants like the Chernobyl and Fukushima which were preceded by the Three Mile Island and the Windscale disasters. Various augmentations about nuclear power developments show such developments are predominantly viewed with suspicion around the world. The effects of nuclear incidents can last more than one generation and are alarming. This has made the international community very cautious about allowing member states to engage in nuclear programmes.

Countries that already own nuclear weapons are not interested in allowing others to augment nuclear weapons for fear of being attacked. The author posits that the restrictions on the possession of nuclear weapons are laudable developments for the international community, since the uncontrolled use of nuclear power would mean increased competition among the member states.

The UAE co-operates with other nations that work towards the peaceful use of nuclear active materials and has ratified the NPT to be accepted by the international community. The researcher argues that the peaceful use of nuclear energy for scientific and technological development helps a country to attain growth when compared to other countries that do not venture into exploiting this form of energy.

The international community has accepted the IAEA's guidelines on safety, security and protection. These guidelines are carefully drafted by the agency, taking into consideration the flaws of nuclear installations that were damaged and the reasons for such accidents.

The IAEA guidelines are not made mandatory unless assistance is sought from the agency. The author also argues that this position would not ensure the eradication of risks involved in nuclear power reactors.

The UAE has gained from abiding by international conventions and instruments that deal with nuclear safety, ranging from the protection of nuclear power plants and materials to the safe disposal of nuclear wastes. This has stimulated global confidence in accepting the use of nuclear energy for power production. The difference is in the outcomes of the Three Miles Island and the Chernobyl nuclear accidents, making it evident that if all the safety standards are followed, there is a possibility that nuclear activity will not affect the host population of the nuclear plant and that nuclear reactors can produce substantial amount of power at low cost with unparalleled reliability.

The use of nuclear energy for peaceful purposes is not restricted by any international conventions or treaty. The ill effects of nuclear energy can be devastating. This has made the international community sceptical about the use of nuclear energy, even for peaceful purposes since it requires high levels of safety and security measures to make sure that it will not lead to a catastrophe. It is also necessary to consider the future generation while encouraging the use of nuclear energy for power production or other peaceful purposes. The use of nuclear energy is a serious issue and requires stringent planning for enabling development.

The UAE is aiming only at peaceful nuclear programme rather than for any illegal purpose(s). Therefore, there has been increased need for the protection of transparency in the programme. The UAE consciously avoids the enrichment of nuclear fuel, since that would create doubt regarding the intentions of the country, because enriched uranium or re-processing of plutonium is used to produce weapons.

The UAE adheres strictly to the rules and regulations of the international codes monitoring the safe management of nuclear energy. The country is open to external advice and input in these regards. In addition to the domestic agencies, there are international agencies that regulate the affairs of nuclear power programmes. The World Association for the Nuclear Operators is a union of countries that use nuclear energy for power

production. These countries help each other and offer recommendations for safer handling of the nuclear energy.

The UAE has also become a member of various organisations. Primarily, the UAE is a member of the IAEA, thus subjects itself to the regulations and rules of IAEA thereby has given its acceptance to the peaceful usage of nuclear energy. The ratification of NPT by the country strengthens its resolve to follow the treaty guidelines and the regulations of the IAEA.

7.2.3 Legal and liability issues

The nuclear policy of the UAE, along with the liability regime has been prepared in line with the international instruments to make the operator exclusively liable for the damage caused by nuclear accidents. It also limits the period within which a claim for damages can be brought by the claimants. The UAE has passed to Phase 3 of the IAEA's review, with the signing of the international convention on civil liability in cases of nuclear accidents and the Joint Protocol to the conventions in 2012.⁷⁹² Though only recommendatory in nature, the country adheres to the above international guidelines.⁷⁹³ Victims may not be able to attain compensation from the nuclear operators when a nuclear accident happens if countries fail to accept these guidelines.

From the analysis, the researcher subsequently discovered the following ambiguities in the proposed UAE Federal regulation, as well as some discrepancy between the IAEA's laws and the country's nuclear law.

In the Federal regulation of UAE, nuclear damage is stated in Clause (7) of the definition as "Any other economic loss, other than loss caused by the impairment of the environment"⁷⁹⁴. However, the IAEA's amended regulation provides that only if such loss is permitted by the international law on civil liability of the competent court.

⁷⁹² Ali Vaez, Karim Sadjadpour, (2013). Iran's Nuclear Odyssey: Costs and Risks Report April 2, 2013. [Online]: Available at: <http://carnegieendowment.org/2013/04/02/iran-s-nuclear-odyssey-costs-and-risks/> Accessed on 26/02/2015.

⁷⁹³ See Ali Vaez, Karim Sadjadpour, (2013).

⁷⁹⁴ Nuclear Law Decree No. 4 of 2012.

Clause 4 makes nuclear damage to include: “the costs of measures of reinstatement of impaired environment, unless such impairment is insignificant, if such measures are actually taken or to be taken, and insofar as not included in paragraph (2) above”. This means that the UAE Law recognises damage to the environment but depends on the level of damage caused whether significant or insignificant

Under the definition of nuclear incident, the UAE’s federal law does not include the IAEA’s statement “creates a grave and imminent threat of causing such damage”.⁷⁹⁵

Article 3 states that the operator of the nuclear installation shall be liable for any damage.⁷⁹⁶ Nothing is mentioned about the state or the country. A reading of this provision indicates that if there is any damage caused because of the operation of the nuclear installation, the responsibility shall rest with the operator. So, if the operator of the nuclear installation is a private party, this means that operator shall be fully liable and the state does not have any kind of liability at all. However, if the operator is bankrupt, whose responsibility is it to compensate the victims of nuclear incidents?

Again, Article 4 clearly states that the operator shall be solely responsible for any liability whatsoever.⁷⁹⁷ However, as per the Convention, the installation state has a shared responsibility, yet this is totally excluded in the UAE’s Federal law. The installation state can exclude liability only for carriage that happens within that territory.

Article 7 of the Federal law states that “If the operator proves that the nuclear damage resulted wholly or partly either from the gross negligence of the person suffering the damage or from an act or omission of such person done with intent to cause damage, the court may relieve the operator wholly or partly from the obligation to pay compensation in respect of the damage suffered by such person.”⁷⁹⁸ However in the Vienna Convention, it speaks about exclusion such as armed conflict, hostilities, civil war and insurrection. These aspects are not mentioned in the Federal law of UAE.

⁷⁹⁵ IAEA’s amended Protocol.

⁷⁹⁶ See Nuclear Law Decree No. 4 of 2012.

⁷⁹⁷ See Nuclear Law Decree No. 4 of 2012.

⁷⁹⁸ Nuclear Law Decree No. 4 of 2012.

Liability during transportation is not mentioned in detail in the Federal law.⁷⁹⁹ What happens in case there is an accident during transportation? Whose liability is it then? These aspects are not clearly explained in the federal law.

Under Article 12 (2) of the jurisdictional clause, it is stated that “The provisions of this Law by Decree shall apply to actions related to civil liability for nuclear damage. The provisions of the 1997 Vienna Convention shall apply wherever no provisions are made in this Law by Decree.”⁸⁰⁰ However does that mean in the case of jurisdiction, or in the case of the entire law? Also, the criminal liability is totally avoided. Will this involve any criminal action at all?

Though the Federal law is not as comprehensive as the IAEA regulation, it is nevertheless stated therein that any absence in law or lack in the law, will be addressed by the IAEA law, but whether the whole law applicable or not is not clearly stated.

The author learned that the Federal Law No. 4 of 2014 does not regulate acts of terrorism or extremist activities. In other words, the law does not say whether the operator would be held responsible for damage because of the afore-mentioned activities. However, in Japan, the operator is held responsible for damages caused by natural disaster, for example an earthquake or tsunami. In Europe, the law stipulates that operators are not responsible for harm caused by natural disasters or war.

The researcher recommends that the UAE should conduct a detailed study of the possible liabilities that might arise from nuclear power plant project(s) and prepare the national legislations accordingly. It should also be admitted that the national legislations should have a restriction on the liability amount, to encourage more promoters for nuclear power generation.

The researcher also suggests that national legislations should include liability for environmental damage too. The state can also endeavour to frame a set of guidelines for safety and security of the plant, along with measures to reduce damage to the environment. The state should ensure that all precautionary methods are adopted to

⁷⁹⁹ See Nuclear Law Decree No. 4 of 2012.

⁸⁰⁰ Article 12 (2) Nuclear Law Decree No. 4 of 2012.

minimise damage to flora, fauna and mankind. This could lead to a more successful power generation programme in the country.

7.2.4 Sustainable use of energy

The present scenario in the international community is such that non-renewable sources of energy are unable to meet the growing needs of power, due to industrialisation and ever-growing populations. Therefore, it is necessary to exploit the possibilities of nuclear energy and to keep pace with the changing environment for industrial, as well as ecological, reasons. Such exploitation however, needs to take care of the security, safety and safeguard of the nuclear plants and nuclear active materials.

The conventional methods of electricity production would mean the use of water, natural gas or oil. Even though the UAE is rich in petroleum resources, its constant use would mean continuous depletion of petroleum resources that could not be replenished in the foreseeable future. Not only this, but these resources will also not be able to provide for the ever-increasing power requirements of the economically developing nation. Therefore, the cheaper option, capable of producing the required commercial quantity of power in the UAE was found to be nuclear energy.

The generation of power using nuclear energy is to meet the increasing needs of the present population. It is factual that the generation of power from nuclear sources equally generates nuclear wastes that can last for many, many years and can affect the generations to come. The author therefore argues that the current generation has a duty towards the future one, which is to protect them, by making sure that no harm is, or will be caused. This can be achieved to some extent by using a reactor that can re-use the nuclear fuel, thus reducing the nuclear wastes. Partitioning and transmutation is one method that can reduce the production of nuclear wastes. Such a reactor can provide for the current generation's increasing demand for power, while reducing the amount of nuclear waste that is produced, which in turn reduces any harm done to the future population.

The legal framework provides for the moral needs of the society. The standards of safety and security as provided by the IAEA strive to achieve the safest method of operation of nuclear power plants. The legal framework provides for strict liability to the operator,

which means that the operator will be cautious enough to prevent any accident or leakage in the nuclear power plant that can affect the generations to follow.

7.2.5 Local content and manpower development

The construction of a nuclear plant in the UAE meant training the inhabitants of the country to run it. It is rather unusual that most the employees in the UAE are from foreign countries. The researcher observes that Emirate nationals are not technically skilled or trained to take on the higher posts in the nuclear power plant. The construction of the power plant thus meant imparting skills to the Emirate nationals. The contractual obligations between UAE and the Korean Consortium involve imparting the former with the knowledge and skills to work in the plant through GNEII.

The country's genuine need to mobilise the inhabitants to control the nuclear power plant is evidenced by the establishment of an institute to imbibe expertise in the field of science and technology. Since the operation and management of a nuclear power plant is risky, it requires a large amount of experience. Thus, the running of a nuclear power plant requires veteran skilled personals.

7.3 Recommendations

Having analysed the various issues that are intrinsic in the development of the nuclear power programme in the UAE, this section therefore offers some recommendations that can be adopted for the pursuit of peaceful nuclear power development in the country. These are presented below:

7.3.1 Gaining from peaceful and sustainable use of nuclear power by the UAE

It can be concluded that nuclear power generation is important for the development of a country and caters for its growing needs. With the decreasing non-renewable sources of energy production, nuclear energy would enable the UAE to sell the extra power produced, thereby increasing its financial capacity. Without exporting energy, the country can attain economic development with proceeds from commercialising nuclear power

generation when compared to other sources. Therefore, the UAE is expected to grow economically in the future.

7.3.2 Formulation of safety and security measures

The International Conference on the Safety of Nuclear Power and the suggestions of the IAEA General Conference has given hope that there would be an international consensus on the safety measures to be adopted in nuclear power plants⁸⁰¹. This way, to some extent, the moral obligations are met.

The safety measures need to be formulated on a national basis, but the basic ideas on which these measures are formulated need to be the same all around the globe. The IAEA can take the lead in formulating international criteria of safety. The Agency can be inspired by the works of Euratom in creating a standardised method of safety in nuclear power plants. The Vienna Convention on Nuclear Safety aims at addressing the need for a standardised approach to the safety measures⁸⁰².

The peaceful use of nuclear energy can be encouraged only with stringent rules that prevent its use for military or destructive purposes. In addition to nuclear non-proliferation, strict rules are required regarding the safeguarding of nuclear power plants.

It would be appropriate that the UAE should make laws to prohibit any acts of terrorism in the country. It would also be better if the Gulf region or the Middle East could make a regional decree in this regard, to ensure the safety and security of particularly nuclear power plants in the region.

7.3.3 Emergency Preparedness and Response

Another important instance which requires an international framework is when there is a nuclear accident. There is need for emergency planning should there be any disaster(s). Such plans should be ready to be utilised immediately, since the time available to respond

⁸⁰¹ International Atomic Energy Agency (IAEA). *IAEA Illicit Trafficking Database*. [Online]: Available at: <http://www-ns.iaea.org/security/itdb.htm>, last Accessed August 7, 2012.

⁸⁰² IAEA, <http://www-ns.iaea.org/conventions/nuclear-safety.asp>, Last Accessed August 24, 2012.

to such cases is often limited. The ‘Preparedness and Response for a Nuclear or Radiological Emergency’ document published by the IAEA is now a part of the safety Standards of the IAEA.⁸⁰³ It is important to note that the emergency response systems in each country may differ, but are assessed based on this criterion as well as international standards. UAE is committed to meeting the IAEA standards of safety, as well as complying with their stipulated regulations.

In the past, there have been various instances of nuclear mishaps, notably Chernobyl and Fukushima. An emergency response system that is set up internationally helps in reducing the impact of such mishaps, but it is not sufficient to prevent such accidents from happening. There should be a domestic system that deals with the required steps to be followed in case of a nuclear accident and the public should be warned of the effects of such nuclear accidents to minimise the shock of a nuclear mishap⁸⁰⁴.

The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency makes the IAEA responsible for helping nations to identify the useful steps in developing their own mechanisms for early response to nuclear mishaps⁸⁰⁵. It is therefore important that countries should adopt the ‘Preparedness and Response for a Nuclear or Radiological Emergency’ formulated by the IAEA. This forms a comprehensive and single set of regulations and standards to be followed by all the countries in a unified manner⁸⁰⁶.

The above should be unreservedly considered and maintained, since the three steps of nuclear power plant operation which include mining, milling and waste disposal are most risky and can bring harm to human beings. The international community therefore needs to formulate standards to be maintained while performing these steps to avoid harm to living beings.

⁸⁰³ Ibid. IAEA

⁸⁰⁴ Srikanth Hariharan, ‘Nuclear Safety, liability and non - proliferation: a legal insight’, 2012 IELR 108.

⁸⁰⁵ International Atomic Energy Agency, *International Atomic Energy Agency Illicit Trafficking Database*, see: <http://www-ns.iaea.org/tech-areas/emergency/preparedness.asp?s=1&l=1>, Last Accessed June 7, 2013.

⁸⁰⁶ Ibid. IAEA

7.3.4 Prosecution of defaulting operators

The nature and implications of a strict liability system, as opposed to a fault-based system, should be developed. Operators of nuclear power plants in the UAE must operate in line with the provisions as stipulated in the licences granted them. Anything short of this should cause their licences to be revoked. Also, proper jurisdiction and prosecution should be invoked on them. This will make operators carry out their functions morally and ethically.

7.3.5 Compliance with national and international laws

High level scrutiny is required in nuclear power production. This is to ensure that the operation and control of the plant(s) follow national laws and regulations⁸⁰⁷. To increase the use of nuclear energy for useful purposes, there should be an unambiguous assurance to the international community that the use of nuclear energy will not result in health issues through radiation, if the safety guidelines are followed.

7.3.6 Control of operations and enforcement of liabilities

While private nuclear power plant operators could be theoretically constrained in operating the installation under stringent checks and balances, nevertheless, government agencies are believed to be more proficient in running such sensitive establishments. In this regard, proper legislation is required regarding aspects associated with insurance, the contractual obligations and the required licences towards ensuring the efficient functioning of the installation.

Although the bottom line limitations have been somewhat relaxed in the reviews conducted in 2004 in comparison to the 1997 Protocols, non-nuclear states are nevertheless encouraged to adhere to the pre-review limitations. This is for the benefit of the nuclear operators even if the associated benefits to victims do require further clarification and study. In consideration of the fact that victims are generally required to initiate any litigation in the justice system of the nuclear state, the fact remains that the

⁸⁰⁷ Reece R. et al, op.cit.

avenues of recourse are nevertheless limited. Even if there could be certain options for the victims, they would still be constrained utilising the full range of benefits due them. And, if the claims are in the range of sever billion Euros, they would certainly be at a disadvantage.

7.3.7 Need for State liability

As earlier discussed, the responsibility of running the nuclear power plant(s) rests with the holder of the licence. According to Article 21 of the Joint Convention, primarily, the responsibility of nuclear active waste management rests with the licenced operator. But if there is no such operator who can be held liable, the liability rests with the state itself. Thus, the state authorities must take the necessary measures to deal with radioactive materials⁸⁰⁸.

Generally, a sovereign state is liable for any act within its territory resulting in harm to the international community. Even if the state does not have the intention to cause such harm, the liability lies with the state to compensate for the damage caused⁸⁰⁹. In practice, though, if the state has taken all the necessary available measures to ensure the operation, maintenance and management of nuclear active substances, no liability would be induced on such state⁸¹⁰.

The 1963 Vienna Convention deals with nuclear accidents. It provides for the liability of the individual responsible for the nuclear power project and not the liability of state⁸¹¹. From this analysis, it can therefore be inferred that it is not the installation of a nuclear plant that should be given caution, but its constant supervision. It is therefore recommended that an authority should be set up to keep track of work progress on the installation of nuclear power plants. It is also rewarding if the state is made liable for all

⁸⁰⁸Ibid, Article 21.

⁸⁰⁹ Rudolf Bernhardt, Ulrich Beyerlin, Karl Doehring and Jochen Abr. Frowein, *Restatement of the Third Law: The Foreign Relations Law of the U.S.*, Vol. 1 (St. Paul MN: American Law Institute Publishers, 1987).

⁸¹⁰ Alexandre Kiss & Dinah Shelton (2004). *International Environmental Law* 624 (3d ed.); World Nuclear Transport Institute, Fact Sheet no. 1, Safety Regulations Governing the Transport of Radioactive Material. Available at: http://www.wnti.co.uk/UserFiles/File/public/publications/factsheets/wnti_fs_2007/FS-1.pdf Last accessed on 6th June 2013.

⁸¹¹ Alexander Kiss, 'State Responsibility and Liability for Nuclear Damage', 2008 Denv. J. Int'LL&Pol'y 35:1, 67

the damage caused by nuclear activity to the environment, or any damage caused by a nuclear mishap. The state should be obliged to ensure that the operators of nuclear power plants abide by the international rules and regulation regarding safe operation of said plants⁸¹².

It is also mandatory that even if a violation of international obligation does not result in damage, it should give a cause of action for other rule abiding nations to bring an action against such state. Only then would the obligation of states to abide by such rules have the desired result.

7.3.8 The need for legislative fortification

In the revised version of the Vienna Convention, states are liable for damages across a broad spectrum. Hence, non-nuclear states and non-contracting states would perhaps do well to consider the pros and cons of signing the revised version of the Convention, especially in consideration of the time limitations offered to victims to file claims in the event of damages. Hence, national governments should draft the necessary legislative measures before joining and signing up to such treaties, to at least ensure their installations would not be liable where radiation and damages is caused by terrorist attacks to their installations, or other similar grave and unforeseen circumstances.

The CSC does not set any specific bar on the minimum time for which the nuclear installation is liable to pay damages, although it does recommend that the upper limit be determined by each individual state's national legislation. The UAE imposes the limitations recommended by the Vienna Convention.

When a country becomes a full-fledged member of the Vienna Convention, they are required to specifically indicate their compliance to Article 19 of the Convention. Such an initiative would ensure that the nation would disassociate with countries which have only ratified the un-amended Vienna Convention, if these nations would always try fulfilling their obligations at the lower levels only. Such nations have declined to be liable in case of terrorist attacks on their installations, which is of major global concern.

⁸¹²Ibid.

National governments are responsible for all aspects of the safety of a nuclear installation erected within their sovereign boundaries and may not refuse responsibility in the event of terrorist attacks on their facilities. It is imperative that they should be willing to provide required funding for the operation of an international tribunal, if there is such a need and, should fulfil all their obligations in monetary terms if the situation arises. It is not encouraged for national governments to try limiting their liabilities or capping the same.

The establishment of a compensation fund instead of backup funding is encouraged. This is agreeable, even if the former stipulates stringent provisions determining its usage. The UAE should ideally set up a fund which should contribute towards fulfilling the damages inadvertently caused to individuals. This would help in significantly building the credibility of the national government in this regard, besides meeting the Convention's stipulations.

Nevertheless, the mechanisms dealing with nuclear power projects and nuclear reactive materials are controllable for the time being, but the absence of a global law that deals with nuclear power production generally is of concern. The trade relating to nuclear active wastes and spent fuel have restrictions, if GATT is made applicable to them. The WTO and the IAEA must work complementarily to bring about the required changes in the international business relations and to create new rules for trade in spent fuel and nuclear wastes. The national initiatives also require proper professional training for the nuclear power operators and increased public awareness to deal with the fears the public have regarding the hazards of nuclear power plants.

7.3.9 The need for legal provision for compensation for financial injury

It is important that the UAE enact governmental legislation to set limits on the liability of nuclear power plants in case of claims arising against them. Normally, private insurers have balked at providing insurance coverage in this regard; the government's actions could encourage the private sector to step up their efforts and reduce the gaps currently observed. Presently, private insurers are reluctant to cover unlimited claims and would contest the same if they were made to do so.

It is recommended to establish a civil liability regime related to the nuclear power sector, which could delineate the responsibilities of a nuclear power plant operator vis-à-vis the public. Usually, the operator is bound to ensure that the public is not affected by nuclear radiation at any time during the plant's operation or during the movement of radioactive material from one location to another.

The legislation enacted by the government should make the operator fully liable in the event of any breach in this regard. The laws ought to be such that the operator should be made liable, even if they could perhaps plead that they were not directly responsible for the damages caused, since even indirect culpability in such instances should be enough to prosecute the operator. If multiple operators were found to be culpable, it could be arranged for them to be jointly and severally liable.

The text of the legislation should provide the contractor the benefit of not allowing the operator to be indemnified against any individual and should not allow an individual alone, to be liable in the case of damages caused by the operator's actions. Thus, even when a contractor working on behalf of the operator is responsible for a malfunction which causes damages, the operator alone should ultimately be responsible. On the face of it, this could be in divergence to the laws of negligence.

7.3.10 Ratification to international instruments relating to nuclear accidents and damages

Gaining from the analysis of the nuclear accidents, the UAE while entering a phase of nuclear power generation in 2017 should ratify the international instruments relating to nuclear accidents and damages. Even if there is a strong national legal system which deals with such a scenario, only if the country is party to the international instruments, can it avail itself of the international system of liability restrictions and receive support from international agencies when required, for compensating the victims in case of an accident. The adherence to international instruments in relation to safety and security measures would also help in realising enhanced safety for the nuclear power plants. In addition to adhering to the safety standards, the UAE being characterised by specific features like high petroleum reserves can bring about changes to the international regime that suits its specific characteristics by imbibing such changes in their national legislations.

After each nuclear accident, it is realised that the existing system of international regulations and methods of calculating liability is not sufficient to compensate the victims and to promote nuclear power generation. After the Fukushima accident, it was also realised that the domestic system of regulations and quantifying compensation is not effective when it comes to accidents that result in drastic damage(s) to mankind and the environment. A lone operator of the nuclear project cannot raise the amount to fulfil his liability towards such victims. Therefore, the adherence to international systems of regulation, as well as quantifying compensation became necessary.

It is common law that the liability to compensate victims of nuclear accidents rests on the operator who holds the licence. At times, the compensation amount to be paid to the victims may be too high for the operator alone to pay with insurance policies and other financial securities available to him. Then the state has the liability to pay the remaining amount. The obligations of the state in such circumstances can be fulfilled with the help of international organisations and institutions like the IAEA and OECD, through their mechanisms of pooling in the international funds. This might not be possible if the country in which the nuclear mishap occurs is not a party to any of the international conventions or associations.

Since nuclear accidents may have a wide-ranging, extensive effect, which may sometimes travel beyond the geographical boundaries of a state, it is possible that domestic systems of regulations and liabilities will not be sufficient⁸¹³. The liability of the state is a de-facto liability to the victims of a nuclear accident that has harmful effects on a large area of land, possibly extending beyond geographical/national boundaries, without any means of human control.

This necessitates a more developed method of quantifying and spreading the liability of a nuclear accident. Since the extent of damage is too vast for the operator alone to compensate, it is highly necessary to form a liability regime that includes the state in which such accident occurs. The international organisations and associations can also take up a moral supporting role, to alleviate the damage caused by nuclear accidents.

⁸¹³Lamm, 'Vanda (2006). The Protocol Amending the 1963 Vienna Convention'. In: '*International Nuclear Law in the Post-Chernobyl Period*', OECD-NEA, (Paris, 2006), p 174.

It is high time that there is a liability clause which makes the state that gives the licence to the operator responsible for at least the trans-boundary harm a nuclear accident may result in. It is recommended that the state is made responsible for alleviating the injury caused to persons within the country, above the limitation of the operator's liability. In the absence of such a liability, the public grievously affected by the nuclear accident that resulted from a project intended to benefit the whole State would be left without much support, since there is a limit on the amount payable by the operator.

The fact that the UAE has decided to develop nuclear power generation highlights interest more countries have in wishing to start developing nuclear power generation projects. But the enthusiasm for this endeavour can only be protected for the long term, if the necessary safety precautions and security measures are taken. It is also recommended the country has a clear system of liability quantification and compensation payments in case of damage resulting from nuclear mishaps. It is also possible to augment public support by increasing the responsibility of the State to protect the wellbeing of the public and the environment, rather than making only the operator liable for damage caused by nuclear accident(s).

In order to have a successful nuclear power-driven industrial development in the UAE, safety of such projects should be given prime importance. The construction of legal responsibilities of the operator and the state is secondary to the safety and security concerns.

Recently, the law relating to nuclear power generation has matured. From the occurrence of various nuclear disasters, the international community saw the need for changes in existing legal systems, both nationally and internationally. Since radioactive substances can also cause damage to the environment outside national boundaries, the international community deems it necessary to strengthen the international groups and is still working on the system.

The management of waste from nuclear power projects poses a higher risk, since it is a continuous process. For if the nuclear power projects operate, radioactive wastes will be generated. In many of the places where nuclear projects are functioning there are high

risks of nuclear contamination. The main reason for this is the unscientific methods adopted. After the Fukushima accident, there has been a slow phase for the development of nuclear power plants. Many of the countries have resorted to dismantling their existing nuclear power plants. This has increased the risks and amounts of nuclear active waste products.

The disposal of contaminated material is much more difficult than managing the waste from nuclear power plants, because the quantity of contaminated materials is much higher when compared to the quantity of waste produced. So, there should be proper regulations and procedures set to attain proper management of waste from nuclear power plants. The UAE needs to specifically focus on the management of nuclear waste in a scientific way to bring about the desired goals without damage to the environment.

7.3.11 Changes that could be brought to the International Regime

There are certain features that make the international regime of nuclear liability less than efficient. These factors are discussed as follows.

As stipulated in the Rio Declaration, basic principle should be included in the international nuclear liability regime to provide full satisfaction of the harmed and to do the needful to minimise its ill effects on the environment⁸¹⁴.

The international system of computing the nuclear liability should take the burden of proof away from the victim to make the liable person responsible for the accident. A restriction or exemption to the liability of the operator would result in giving an upper hand to the nuclear investors and at the same time burdens the harmed⁸¹⁵. In this era, there is high possibility of attacks from extremists or terrorists. Despite such a possibility the international conventions exempt the operator from his liability in case of armed conflict, hostilities, civil war and insurrection. When there is nuclear accident due to terrorist attack, the victims will not be properly compensated for the damage suffered.

⁸¹⁴ Rio Declaration on Environment and Development, June 3-14, 1992, princ. 16, UN Doc. A/CONF.151/26 (Vol. I) (June 16, 31 ILM 874 (1992). Available at: <http://www.jus.uio.no/lm/environmental.development.rio.declaration1992/doc> Last accessed on 15-07-2013.

⁸¹⁵ Ibid. Rio Declaration.

The operator may be exempted from liability in such circumstances and this would affect the injured. There are also chances of drastic climatic conditions that may have been predicted already.⁸¹⁶ In such circumstances also the injured should be able to raise their claim against the operator.

Another significant characteristic of the international conventions is that the amount of damages is restricted. The way in which nuclear accidents can affect the person and property of individuals in various nations are neither restricted nor limited. Therefore, restrictions or upper limits in the compensation amount would result in hardships to the injured. According to the Vienna Convention, each State is given the power to decide either on increasing the upper limit of compensation, or making it unlimited. However, not many States have increased the limit of compensation payable. If the amount liable for nuclear injuries is not restricted, the operator would find it difficult to get insurance coverage for compensation for which he may be liable after a nuclear accident⁸¹⁷.

The steps taken by some of the countries in increasing the cap of compensation amount are nowhere near the actual injury that is caused by a nuclear accident. According to the IAEA Explanatory note, the cap in the compensation amount is intended to boost nuclear investment and acts as an advantage for them⁸¹⁸. From the statistics, it can be inferred that there is a discount of about twenty billion Euros a year attributable to the cap created in the international conventions on the liability amount of the nuclear plant operator⁸¹⁹. If the liability amount is made unlimited, then the expense that will be incurred by a nuclear power operator would increase by three hundred percentages, by way of insurance premium⁸²⁰.

⁸¹⁶ Intergovernmental Panel on Climate Change [hereinafter IPCC], *Third Assessment Report: Climate Change 2001: Impacts, Adaptation and Vulnerability*, para. 12.1.5.3. Available at http://www.grida.no/climate/ipcc_tar/wg2/468.htm, last accessed on 15-07-2013, para. 12.1.5.3.

⁸¹⁷ IAEA, The 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage Explanatory Texts, at, note 230, page 12, IAEA Doc. GC(48)/INF/5 (Sept. 2, 2004), available at <http://www.iaea.org/About/Policy/GC/GC48/Documents/gc48inf-5expltext.pdf> last accessed on 15-7-2013.

⁸¹⁸ IAEA Explanatory Notes, op.cit.

⁸¹⁹ Greenpeace International, (2005). *Invest in a Clean Energy Future*, 15 (July 2005) (written by Antony Froggat and Sven Teske). Available at: <http://www.greenpeace.org/raw/content/international/press/reports/SubsidiesReport.pdf> Last accessed on 15-07-2013.

⁸²⁰ Ibid. Greenpeace International.

Thus, in effect the present international system allows only for a limited amount of compensation to nuclear accidents and the damages that occur due to the accident. The limitation in compensation would affect the environment at large and the interests of those States that have not utilised the nuclear energy.

The present international system of computation of liability arising from a nuclear accident has been limited to claims that have been raised within the limitation period of 10 or 30 years, according to the nature of the injury. The very peculiar feature of nuclear active materials however, is that the injury that may be caused by such radioactive materials would remain latent for many years and sometimes even for generations. The limitation period now in force would make some injuries ineligible for compensation. There should be a different mechanism for deciding the time limit, since the injury could have arisen many years after the accident.

The present international system of nuclear liability concerns the liability of the operator alone, since the operator is made exclusively liable for all the damages that may arise from nuclear accidents. This helps all others related to the nuclear power plant secure their interests, since only one person will be targeted by the victims to realise their claim. The restriction of liability on one person would affect the interest of the injured on the other hand. Also, during the movement of radioactive materials from one place to another, the parties involved in such transactions should be made liable jointly and severally. According to the IAEA Explanatory note, the purpose of limiting the liability of the nuclear active damage on the operator alone is to save the injured from having to prove the liability of other parties to the incident.⁸²¹ Yet in practice, the injured should be given the option of claiming against others, like the suppliers, who are also responsible for the nuclear accident to an extent and it is for the injured to decide whether to take a chance in proving the guilt of the person against whom the claim is made.

In the present system of nuclear liability law, the operator is the only person made liable for the damages caused by nuclear accidents. If under some circumstances, the person liable does not pay the compensation amount, or is unable to make good for the loss(es) suffered, the injured will not be compensated for the damage suffered by the victim. To

⁸²¹ See IAEA Explanatory Note.

avoid such a situation, there should be an alternate arrangement to pay for the damage caused by nuclear accidents through an alternate financial security.

According to Burges Salmon LLP (2005), there are general law routes for assert compensation resulting from damage to the environment such as nuisance and negligence; nevertheless, a number of torts can as well be exploited and, since they are forms of strict liability, might be an additional dominant instrument for claiming for such losses. Though in presumption, there is no genuine connection between these torts, practically, the courts are expected to use thoughts from any reported cases when taking into consideration other legal torts. Statutory environmental torts are infrequently used by claimants who have suffered environmental harm, but they are realistic tools in that they compel strict liability regimes and as a result avoid the complications drawn in establishing mistakes on the part of the defendant.⁸²² Burges Salmon LLP (2005) says that they have in recent times used the statutory tort arising from the illegitimate dumping of waste to achieve a six-figure settlement for a client in situations where there was no other reasonable opportunity of recuperation signifying that consciousness of these statutory torts is imperative, to guarantee that chance to recover losses are not ignored.

Under the present international regime, the claims that arise from damage caused by nuclear accidents can be brought before courts of law in the State where the nuclear power plant is situated. This would affect the victims since their claim would be decided by the courts in the operator's country. The claims of the victims may not be properly ascertained since the court that deals with the claim is of the operator's State. It is often cited by the scholars that in *Merlin v. British Nuclear Fuels PLC*⁸²³, the court in the UK was not

⁸²² Burges Salmon LLP (October 2005). Legal Developments Worldwide. Statutory Environmental Torts - An Underused but Powerful Resource. [Online]. Available at: <http://www.legal500.com/developments/144> Accessed on 05/09/2016.

⁸²³ *Merlin v. British Nuclear Fuels, PLC*, [1990] 3 All ER 711, 720 - 21, [1990] 3 WLR 383.

In this case, the claimants found out that their house had high levels of radiation due to the presence of radioactive dust from the defendant's Sellafield Nuclear Installation so they wanted to sell it. The public was aware of this and the house was sold at a much-reduced price. Due to this, the claimants decided to exploit the statutory tort in order to be compensated for their house value because of radioactive contamination and risk of damage to their children from being exposed to the radiation. Both claims were dismissed by the High Court holding that radioactive dust could not be 'property damage' reason being that the radioactive dust did not alter the molecular structure of the house. This was, irrespective that the radioactive dust could be removed, the presence of the dust in the atmosphere would subsequently contaminate again after a short period of time. Similarly, an increased risk of cancer was not physical damage and could not be claimed under a normal understanding of the provision of the 1965 Act. This actual interpretation of 'property damage' has been argued and following cases have expanded its scope. See: Burges Salmon LLP (October 2005).

prepared to accept the claim of the plaintiffs that their house was affected by nuclear active materials that affected the health of the inhabitants on the long run. The court held that since there was no fault found in the house that could be seen such claim cannot be entertained. According to the court in the UK a house being affected by radioactive nuclides do not necessary lead to an injury that was the result of a nuclear incident since there was no physical tampering to the house and the possible effect of the presence of nuclides would be cancer that can be caused due to other artificial and natural radio activity.

Later, in the year 1998 in *Blue Circle Industries plc v. Ministry of Defence* case⁸²⁴, the court of first instance was pleased to hold that damage has been caused by nuclear accident. On appeal, the court of Appeal went by the decision in Merlin's case and held that there was no change in the constituting factors of land and so there was no damage caused.

The victims of these two cases would have felt that their case failed since the decision was made by a Court of the State that had the nuclear power plant situated. The researcher therefore recommends that a neutral authority or tribunal should decide on the claims that arise from nuclear accidents so that there will not be a feeling of bias for the victims of the nuclear activity. This could be in form of mediation [which is a form of Alternative Dispute Resolution (ADR)] where a mediator is appointed by both parties willing to engage in face-to-face negotiation. This aims for clear agreement between the participants as to how they will deal with specific issues while acknowledging a party's feelings. Here, the mediator focuses upon participants' future goals rather than a detailed analysis of past events and while controlling the process does not overtly try to influence the participants

⁸²⁴ *Blue Circle Industries plc v. Ministry of Defence* [1998] 3 All ER 385, [1999] Ch 289

In this case, plutonium escaped from the Atomic Weapons Establishment at Aldermaston. This was caused by the overflow and contamination of the site pond on neighbour's marshland caused by storm water. The contamination was conspicuous so the claimant spent reasonable amount of money in decontaminating the soil and the farmland. It was argued by the defendant that, following Merlin, there had been no alteration to the molecular structure of the land as such no harm had been caused under the statutory tort. The defendant's arguments were not accepted by the Court of Appeal. The Courts however admitted that there had been physical harm to the soil as it had become radioactive waste with less value. This case was different as being a pure economic loss litigation regarding the devaluation of the house. It is disputed whether Merlin was actually a case of pure economic loss. This notwithstanding, the Court of Appeal's decision has expanded the class of physical damage that can be recovered and now consist the costs incurred in decontamination. See: Burges Salmon LLP (October 2005).

or the actual outcome. This process can be completed in one or few sessions. In other words, this process is more economical and not time consuming.

It is interesting to note that the Vienna Convention has provided for the application of the domestic law of the operator to be put in practice when a claim for damages arise out of a nuclear power plant that is situated within the national boundaries of that country without any bias or favouritism⁸²⁵. But, the very application of the domestic law of the operator's country is discrimination towards the victims or injured in the nuclear accident⁸²⁶.

Normally, when there are different actions maintained in different countries, it is the court in the victim's country that will be the proper forum, or the country in which the first action was initiated⁸²⁷. However, while providing for the court of the country in which the operator belongs, it is against the victim's interest since the injured must bear the burden of approaching the court in the operator's country. Instead, if the jurisdiction is given to the court of the place where the injury occurred, the difficulty for the injured will be removed⁸²⁸. This is more important when the damage for which damages are claimed is related to the environment⁸²⁹. According to the Oil Pollution Liability Convention, the

⁸²⁵Vienna Convention, op.cit.

⁸²⁶ Stockholm Declaration of the United Nations Conference on the Human Environment, U.N. Doc. A/CONF.48/14 (1972), reprinted in 11 I.L.M. 1416 (1972) LouisSohn, The Stockholm Declaration on the Human Environment, 15 HARV. J. INT'L. L.423 (1973), and Michael Akehurst, International Liability for Injurious Consequences Arising out of Acts not Prohibited by International Law, N.Y.J INT'L. L. 3 (1985) and International Law Commission, Responsibility of States for Internationally Wrongful Acts, G.A. Res. 56/83, U.N. GAOR, 56th Sess., U.N. Doc. A/RES/56/83 (Jan. 18, 2002) available at http://www.un.org/law/ilc/texts/State_responsibility/responsibilityfra.htm.last accessed on 15-7-2013. See Article 3 of the Convention on Biological Diversity signed at Rio de Janeiro on June 5, 1992, entered into force Dec.29, 1993, 31 ILM (1992) available at <http://www.biodiv.org/doc/legal/cbd-en.pdf> Last accessed on 15-07-2013.

⁸²⁷ Brussels Convention on Jurisdiction and the Enforcement of Judgments in Civil and Commercial Matters 1968, Article 21 on lispendens. Available at: <http://www.jus.uio.no/lm/brussels.jurisdiction.and.enforcement.of.judgments.in.civil.and.commercial.matters.convention.1968/doc.html#137> Last accessed on 15-07-2013.

⁸²⁸*House of Lords in Spiliada Maritime Corporation v. Cansulex Ltd.* [1987] 1 A.C.460 , *Andrew Owusu v. Nugent B. Jackson*, Case C-281/02 , *Piper Aircraft Co. v. Reyno*, 454 U.S. 250 (1981) and Ronald A. Brand, Balancing Sovereignty and Party Autonomy in Private International Law: Regression at the European Court of Justice (University of Pittsburgh School of Law, Working Paper Series # 25, 2005) available at <http://law.bepress.com/cgi/viewcontent.cgi?article=1025&context=pittlwps>, Last accessed on 15-07-2013.

⁸²⁹ Revised Vienna Convention, art. 1(k). See also art. 1(m) and 1(n)

court with jurisdiction to entertain a claim for damages is the court of the place where the injury occurred⁸³⁰.

About the appropriate law to be applied in claims of damages, it is recommended that the law of the injured should be made the practice. Especially when an injury occurs during the movement of radioactive material from one place to another, the injury would normally be suffered at the place where the victim normally resides. So, if the injury happens in a country that is far away from the country of the operator, the victim would find it difficult to get his grievance redressed.

Another shortcoming of the existing international system of nuclear liability is that the financial loss sustained in the case of a nuclear accident is not addressed or such injuries are not properly redressed by the existing international conventions. If the nuclear accident results in economic damage or any other damage that is corollary to the nuclear accident, then the international regime should be applied to such damage also. The definition of damage should also include the injury caused to the environment and marine environment by the nuclear incident.

The court of law should be made accessible to the injured. In some countries, an action can be maintained only if an amount of security has been paid by the claimant. There are also instances when the party which fails in litigation, is made to bear all the litigation costs. This would restrict the injured from claiming damages in the court of the operator's country.

The present international system of nuclear liability has recognised strict liability of the operator helps the victims from initiating action against the operator without being dragged through the process of evidencing the operator's fault. The relationship between the damage and the nuclear incident needs to be proved by the injured and this is a difficult affair for some kinds of injuries. In *Hope v. BNFL*⁸³¹ the Court held that the radioactive substances arising from the Sellafield nuclear facility would not cause cancer, but later

⁸³⁰ International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, art. IX, Dec. 18, 1971, 11 I.L.M. 284, *amended by* 1992 IMO Protocol to Amend the International Convention on Civil Liability for Oil Pollution Damage 1969

⁸³¹ *Hope v. BNFL and Reay v. BNFL* (1994) 5 Med. LR 1

the scientific research showed that the offspring of men who were exposed to such nuclear active materials were at higher risk of blood cancer and non-Hodgkin's lymphoma⁸³². There was a lapse of about eight years in finding the scientific relationship between cancer and the radioactive emissions from the said nuclear plant. Thus, as described above, the restriction of limitation period to a decade is sometimes not enough to effectively compensate the injured, since the relationship between the injury and the nuclear incident may be discovered after the lapse of ten years.

Another important hurdle of the international nuclear liability regime is the number of ratifying States to the international conventions that relate to nuclear liability. There are about five hundred nuclear installations in approximately thirty countries altogether⁸³³. Even so, many of the big players of nuclear energy production like Canada, Japan, India, China and the USA have not accepted the international conventions relating to nuclear liability. Countries like the United Kingdom and France have accepted the Paris Convention, but have not ratified the Joint Protocol and the Vienna Convention. On the other hand, the Vienna Convention has been ratified by Russia⁸³⁴.

Now, the overriding matter for concern is that more and more developing nations are harnessing nuclear energy for power production. But some of the countries like India, China, South Korea, and Japan have not signed any of the international instruments relating to the liability of nuclear accidents⁸³⁵.

⁸³² Heather O. Dickinson & Louise Parker, *Leukemia And Non-Hodgkin's Lymphoma In Children Of Male Sellafield Radiation Workers*, 99 INT'L J. OF CANCER 437, 437 – 44, May 2002, available at <http://www3.interscience.wiley.com/cgi-bin/fulltext/92013261/PDFSTART> Last accessed on 15-7-2013 and *Sellafield Increases Cancer Risk*, BBC, June 19, 2002, Available at <http://news.bbc.co.uk/1/hi/health/2054694.stm>. Last accessed on 15-07-2013.

⁸³³ International Atomic Energy Agency (IAEA) (2005). *Annual report for 2004*, IAEA, at 1, G C (49)/5, available at http://www.iaea.org/Publications/Reports/Anrep2004/anrep2004_full.pdf.

⁸³⁴ Ibid. International Atomic Energy Agency (IAEA) (2005). Twenty-six more were under construction at the end of 2004, eighteen of them being in Asia and Martin Gardner, *Results of Case-control Study of Leukaemia and Lymphoma among Young People near Sellafield Nuclear Plant in West Cumbria*, British Med. J. (1990).

⁸³⁵ International Energy Agency, *World Energy Outlook 2004*, at 34 available at <http://www.iea.org/Textbase/npsum/WEO2004SUM.pdf> (last visited July 15 2013) and Uranium Information Centre, *Plans for New Reactors Worldwide*, (Aug. 2006). Available at: <http://www.uic.com.au/nip19.htm> Last Accessed on 15-07-2013.

7.3.11.1 Ratification of global nuclear responsibility system by non-member and non-contracting states

It is therefore important to have a detailed study of the advantages and disadvantages of nuclear liability from the international perspective. This would make more states accede to international instruments. The various aspects of a single international mechanism to deal with nuclear liability regime are also analysed below.

When a non-member state has not signed any of the international instruments that deal with nuclear accidents and liability, victims in such a country will be best rewarded if the country's decision had been to accede to the international regime. The researcher views that the major issue with non-contracting states is that their domestic laws do not comply with international conventions, for example, after the Fukushima incidence; Japan's domestic law did not cover all the aspects of the disaster, like compensation for victims, so this created some ambiguities between national laws and international conventions.

Since there are many international instruments that deal with the liabilities that may arise in the event of nuclear accidents, ratification of any of these instruments or more of them, would not lead to a uniform method of liability creation. Each international instrument in existence differs in various aspects and, such differing aspects make the ratification of even just one or two such instruments a failure in resulting a common code of liability. The primary factor for having a single method of liability calculation is that every sovereign State must have a connection with each other through international or regional conventions. According to the International Expert Group on Nuclear Liability, the Convention on Supplementary Compensation for Nuclear Damage should an extent achieved this objective by linking the contracting States of the Paris Convention and the Vienna Convention. This Convention has gone beyond the Joint Protocol in augmenting an international account for paying damages for nuclear harm⁸³⁶.

At present, there is no unified code of an international nature that relates to nuclear damages. There are various international conventions which deal with the same subject,

⁸³⁶ The International Expert Group on Nuclear Liability (INLEX), - Recommendations on how to facilitate achievement of a global nuclear liability regime as requested by the IAEA Action Plan on Nuclear Safety, IAEA website: <http://ola.iaea.org/ola/inlex-group.html> last accessed on 15-7-2013.

but there are differences in their provisions. The differences in these instruments make it difficult to form a complete and uniform set of rules and regulations that deal with nuclear accidents and liabilities which arise from such accidents. There is further difficulty because some conventions that have been modified. Some countries have ratified both. It becomes a concern when both versions exist at the same time. This challenge should be overcome, to bring about uniformity and certainty in the sphere of nuclear accidents and the liabilities that arise there in⁸³⁷.

7.3.11.2 Formulation of a single legal code of nuclear liability

It is high time that the law concerning nuclear liability is unified and there should be a single method of computation of nuclear liability. The principles to be followed while prosecuting any person liable for damages caused by nuclear activity need to be uniform, certain and definite. This helps both perpetrator as well as the victim.

It is factual that the operator of the nuclear power plant in which the nuclear accident took place, is the person exclusively liable for such mishap. He is strictly bound by such liability and it is not required by the victim to prove a mistake on the part of the operator to claim damages. It is not mandatory or required for the victim to show that there was an act or omission due to recklessness that led to such accident. It is only required to prove that the victim has suffered damage due to the nuclear accident. This helps the harmed from litigating for years to get the compensation and benefits the victims.

The operator of the nuclear plant in which the accident happened is made the sole person liable for the damages that arise from such accident. The legal principle of exclusive liability in nuclear accidents is different from the usual principles followed in the case of torts. This is because when there can be various persons who can be made liable, this will lead to lengthy litigation processes and filing of various suits to conclude as to the person responsible for the damages caused by the accident. Another important reason for the formulation of exclusive liability is that if all those who relate to the operation or installation of the nuclear plant are made liable, they all must be financially secured

⁸³⁷ Simon Carroll op.cit and *Tokai-Mura Accident, Japan: Third Party Liability and Compensation Aspects*, at 7, Nuclear Law Bulletin No. 66 (Dec. 2000), available at <http://www.nea.fr/html/law/nlb/Nlb-66/013-022.pdf> Last accessed on 15-7-2013.

through insurance policies or other methods⁸³⁸. This would make it difficult vis-à-vis the encouragement of investments in nuclear installations. As the liability of persons increase, they will not be readily interested in getting associated with nuclear power projects. All those who supplied the raw materials for construction and running of the project and those who supplied technological assistance will find it extremely hard to follow up with the litigations and its expenses and for deciding for insurance policies⁸³⁹.

Another legal aspect that pertains to nuclear accidents is that all the monetary claims that arise from the harm caused by nuclear accidents will be entertained only in a court of law in a single State. The competent State party will be determined based on the location of the nuclear accident or the location of the nuclear plant. Usually international and regional instruments give option to the harmed to choose between the court of law of the opposite party's residence or the place of occurrence and the place of injury.

From one view point, the choice of court of law may sound good for the injured. But in practice, giving such options would prove to be difficult for the victims since the funds available for their redress would be at the hands of different courts for disposal. Presence of suits for damages in different courts would lead to a situation where in some victims may be awarded huge amounts of compensation by one court while another court gives a moderate amount of compensation. This would lead to disparity in treatment of injured. When the funds available and the claims are with the same court, all victims would be treated alike and the award of compensation would also be proportional to the injury suffered.

It is important to note that domestic legislations are unable to accomplish the routing of claims to one court, since victims may be from various courts and the injury could also be suffered in different parts of the world. In such circumstances, only an international effort can route all the claims to courts in one country⁸⁴⁰.

⁸³⁸ IAEA, Overview of the Modernized IAEA Nuclear Liability Regime, Annex to IAEA Document GOV/INF/2004/9-GC(48)/INF/5, 2004.

⁸³⁹ Julia A. Schwartz, *op.cit.*

⁸⁴⁰ A paper by the International Expert Group on Nuclear Liability (INLEX), - Civil Liability for Nuclear Damage: Advantages and Disadvantages of Joining the International Nuclear Liability Regime, p.14

The downside of routing all claims to the courts of one country is that the injured may sometimes be forced to raise the claim in a different country to their own. However, the difficulty that may arise due to the need for filing of claims outside one's own country is much less than compared to the merits of routing all claims to the courts of one single country⁸⁴¹.

Yet another benefit of an international regime of nuclear liability is that the judgements of a country can be enforced in another through international instruments only. The judgement of a country can be implemented in another when both countries have ratified the international instrument. In the absence of an international regime, the implementation of judgements would be difficult and the terms of acceptance and implementation of the court orders of one country to another would differ greatly⁸⁴².

The main issue with regards to the international system of nuclear liability is that there is not much participation from the States around the globe in accepting such conventions and instruments⁸⁴³. Even though the Chernobyl accident led to the formulation of a Joint Protocol, many countries that ratified the Paris Convention or the Vienna Convention did not ratify the Joint Protocol⁸⁴⁴. The giants, the UK and France maintained distance from the Joint Protocol.

7.3.12 Development of a nuclear regulatory group in the Middle East - gaining from the EU model

With the UAE being surrounded by several countries, it might be essential to have a regulatory body that oversees UAE's nuclear activity in the region. If UAE were to go by the current system, any dispute with the UAE's nuclear activity would have to be brought in the courts of UAE, which might not be very comforting for other GCC member countries.

⁸⁴¹Ibid. A paper by the International Expert Group on Nuclear Liability (INLEX),

⁸⁴²Ibid. A paper by the International Expert Group on Nuclear Liability (INLEX),

⁸⁴³Duncan E. J. Currie, 'The Problems and Gaps in the Nuclear Liability Conventions and an Analysis of How an Actual Claim Would be Brought Under the Current Existing Treaty Regime in the Event of a Nuclear Accident', 2006 Denv. J. Int'l L. & Pol'y 35:1, 85.

⁸⁴⁴ Joint Protocol Relating to the Application of the Vienna Convention on Civil Liability for Nuclear Damage and the Paris Convention on Third Party Liability in the Field of Nuclear Energy, *opened for signature* Sept. 21, 1988, 1672 U.N.T.S. 302, *available at*: http://www.nea.fr/html/law/nljoint_prot.html Last accessed on 15-07-2013 Last accessed on 15-07-2013.

Following the European Commission's decision to oversee all nuclear power regulatory issues in 2007, they created The European Nuclear Safety Regulators Group (ENSREG). This independent body oversees all nuclear related issues across the EU.⁸⁴⁵ The body is composed of representatives from all 27 member states and includes professionals related to aspects of national nuclear safety, the handling of nuclear waste and ensuring adequate protection and safeguards in handling the same.⁸⁴⁶

The ENSREG is tasked with improving all aspects of nuclear safety and waste management within the member states. Back in 1957 when the European Economic Community (EEC) was being established, the 'Treaty of Rome' had also established the European Atomic Energy Union, also known as the Euratom Treaty. This now works on ensuring uniform nuclear standards throughout the EU, besides ensuring that adequate safety standards amongst workers are maintained and associated information is disseminated across the population residing within their borders.⁸⁴⁷

The Euratom Treaty has provided the basis for handling multiple nuclear issues, including aspects of radiation and nuclear protection, coordinating the disposal of nuclear waste and the movement of spent fuel rods, besides coordinating how nuclear power would be utilised for medicine, scientific and industrial applications.⁸⁴⁸ The Treaty therefore draws up the safety standards and determining the use of this power source during peacetimes. Member countries are also in coordination with Euratom within the EU Framework Programmes related to Research and Technological Development. In coordination with Euratom and the related bodies, multiple legislative efforts have materialised, including the framework for establishing nuclear safety at multiple installations and the Council Directive 2011/70/Euratom of 19 July 2011, which details the handling of nuclear fuel and radioactive waste.⁸⁴⁹

⁸⁴⁵See, The role of ENSREG. Available at: <http://www.ensreg.eu/>

⁸⁴⁶European Nuclear Safety Regulators Group (ENSREG). [Online]. Available at: <http://www.ensreg.eu/members-glance/role-ensreg> Accessed on 24/02/2015.

⁸⁴⁷See, Treaty establishing the European Atomic Energy Community (Euratom), Available at: http://europa.eu/legislation_summaries/institutional_affairs/treaties/treaties_euratom_en.htm Accessed on 15-07-2013.

⁸⁴⁸See, Treaty establishing the European Atomic Energy Community (Euratom), Available at: http://europa.eu/legislation_summaries/institutional_affairs/treaties/treaties_euratom_en.htm Accessed on 15-07-2013.

⁸⁴⁹ See European Nuclear Safety Regulators Group (ENSREG). [Online]. Available at: <http://www.ensreg.eu/members-glance/role-ensreg> Accessed on 24/02/2015.

In the EU, there are several countries which possess nuclear capabilities, however in the GCC, the UAE is the only country that would be introducing nuclear energy soon. Saudi Arabia is also moving in the direction of getting nuclear capabilities, however currently, it is only UAE. Nevertheless, a GCC wide and independent body like ENSERG might be essential.

7.4 Case study of the UAE and contributions to knowledge

The section presents the case study of the UAE and the contributions that this research has made to the knowledge of the field of study.

The UAE was chosen as a ‘case study’, one that is pervasive through this thesis, because not only is it the researcher’s home country but, more importantly, the UAE is a new and developing provider of nuclear energy and therefore creates the opportunity for evaluation of international legal and political obligations, and the ways and means by which a new country can assess and learn from existing providers on matters pertaining to legal and economic regulation and development.

There seemed to be an absence of clarity about the responsibilities of the UAE government in terms of liability during incidents of misuse of the nuclear plants. The research therefore, considered the determination of the efficacy of the country’s nuclear energy laws in dealing with potential liabilities arising from the energy programme. Rather than see the UAE as a discrete paradigm, the thesis develops the issues with relation to the UAE in a consistent and informed manner. This pervasive approach allows for the full contextualisation of the numerous issues within the UAE’s development of peaceful nuclear energy.

The UAE requires tremendous power supplies to meet their demands. As a new and growing provider of nuclear energy, the UAE is required to assess the potential pitfalls and liabilities associated with this important and potentially hazardous activity. The thesis considered these aspects in the following manner:

The establishment of international, regional and local liabilities was presented within a review of the nature of relevant organisations. Thus, the platform for specific review of the UAE was created via the comparative analysis of these international obligations. The research provides (chapter 2) an analysis of the development of international liability regimes, and looks to both current and established authors in reviewing the nature of provision. Thus, the available literature included Heffron (2009), Stoiber (et al) (2010) and Khan (2015). This was reviewed in addition to the established law within the UAE (Nuclear Law No 6, 2009 and Nuclear Law No 4, 2012). This was supplemented by the various international (IAEA) and UAE government reports.

Having established the platform, the research then looked at what were the emerging trends in the development of nuclear energy and liabilities. Established sources such as Nuttall (2004), Findley (2010) and the IEA (2009) were used to identify these trends and these were then connected to developments within the UAE. As a counter point to this, pitfalls associated with these trends were also considered, in order to achieve a balanced review (Holt (et al) (2010) and Grimes (et al) (2010)).

When looking to apply the factors within this platform to the UAE, the researcher was able to access the available source materials from academics and industry providers, although it was noted that such material was limited given the novelty of developments within UAE. Blanchard and Kerr (2010), Mulvey (2011) and Supersberger (2011) provided a solid base for analysis here. The researcher was then able to cross-refer this to the developments within the international arena (Skagen (2004) and Shrader-Frechette (1997) to provide a theoretical underpinning to the work. This was then updated with reference to more recent critics, including Heffron (2009) and Stoiber (et al) (2010).

Having set a platform for theory and development within chapter 2, the researcher was then able to extend the study to look specifically at the UAE. Thus chapter 3 looks specifically at the UAEs motivation and constraints in providing nuclear energy. UAE Government Reports (2010) set the tone, with critical appraisal from the available literature being used to assess the reports such as Blanchard (2010), Kumetat (2011). FANR was reviewed fully, this being the regulatory body of nuclear energy within the UAE. Thus, chapter 3 can be seen to build on the platform provided within chapter 2, and

seeks to place the development of nuclear energy, and the related legal responsibilities, within a practical setting.

The next step was to consider the nature of potential liabilities, the pitfalls that the UAE may face when developing nuclear energy. Analyses of major incidents, and the legal and academic fallout from them was analysed, to see where the UAE could learn from past incidents. Adede (1987), Boyle (1989) and Kemeny (1979) provided clear guidance on the nature of international obligations. Studies of individual incidents (Chernobyl, Fukushima etc) within chapter 4 allowed for the identification and potential application of factors to the UAE. Thus, international legal obligations were considered from source (Paris and Vienna Conventions) as well as the academic reviews of the incidents and the consideration of both international and domestic liabilities (Arnold (1957), Wakeford (2007)).

Chapter 5 builds upon the central thesis by looking at the nature and scope of legal liabilities within the international domain. This is then enhanced by specific coverage and application to the UAE. At this stage the thesis has provided a critical review of the literature and direct legal source materials necessary for the evaluation of the nuclear programme development within the UAE. The lessons from the past, the international and domestic approaches, and the ways to move forward have been established. The latter chapters show how the UAE is currently engaged in the implementation of its goals and policies.

Chapters 6 and 7 show clearly the original contribution to knowledge, by reviewing and evaluating the primary sources data obtained from structured interviews. After the presentation of the findings, the thesis moves to the conclusion and the establishment of recommendations and proposals for future development.

The research evaluates the extent to which the new UAE nuclear law addresses potential liabilities and further makes recommendations towards the effective and safe use of nuclear energy by the UAE through compliance with international best practices.

The non-ratifications to international instruments relating to nuclear accidents and damages by states make it difficult to estimate their levels of sincerity and dedication to decent nuclear power production. From global perspective, this act could show countries' non-readiness for to consider standards of practice to ensure harmless power production. Nuclear power generation follows suit with regulatory resoluteness and strict adherence to led down and required standards and as a matter importance should not in any way be jeopardised.

The changes that could be brought to international regime may not be limited to but bases on complete removal of excessive burden of proof on the part of the sufferer of nuclear accident. This if considered will make liable person responsible for damages or accidents. Burden of proof in practice can be inhibitory to fair hearing, justice and equity as a lot would be required for it to be completely achieved. In view of this, would it be fair to admit or conclude that the sufferer of nuclear damages will be exposed to all needed for a burden of proof to be fully exhausted? This may not be possible and could influence fair judgement.

From the analysis of the research data concerning UAE as the case study, the researcher proposes that with strict readiness and bold commitment to sensitive venture like nuclear power generation as in the UAE, it is possible that despite the huge challenges associated with nuclear production, a sovereign state through its constituted authorities, stringent laws and setting up of compensation limits can deal with harms that may arise from this venture. Although the primary aim of the programme is to better the economy of the state and the standard of living of the citizens when properly harnessed, but in the event of catastrophe, the state takes on the blame (State or Civil Liability) when all other avenues of settling damages prove abortive.

It could also be proffered that the formulation and institution of a regulatory body as well as single legal mechanism dealing with all aspects of nuclear power and especially nuclear liability issues within the GCC member countries can encourage ethical nuclear power production in the region. This equally forms a level playing platform relayed litigations where both the claimants and the defendants can operate within the dictates of such regional laws and as well understand the interpretations of such laws.

Therefore, the researcher proposes that gulf regional states should develop a model for the urgent notification of nuclear incidents occurring in any country within the region. This will ensure immediate response to nuclear incidents to avoid further damage for such incidents.

7.5 Further Research

The author is of the view that this research is the first of its kind to address issues surrounding how the law would be used to manage potential liability in the UAE's nuclear power programme.

The findings of this research will be more beneficial to the development of nuclear energy in the UAE. Also, for the fact that there is little or no research in this area, it is believed that the research outcomes will augment future research in this area. This study has investigated all aspects of the law and liability regarding the development of nuclear energy in the UAE which include: policies and implementations, liability laws, political issues, economic issues, safety and security issues as well as environmental concerns and policies. It is therefore suggested that each aspect can be a subject for further study and be separately examined in depth.

The UAE nuclear law and the implementing regulations are very new and have not yet been tested. Moreover, there are no nuclear energy related cases so far handled in the country and this is one of the precincts of this research. Once the law and the implementing regulations are implemented examining cases under this area, the effectiveness and clarity of the guidelines of implementing regulations in the future will be other areas for further study. Through suggestions, such examination will help to strengthen and enhance the enforcement system.

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Nuclear Energy Law in the UAE:

An evaluation of issues of potential liability in the country's nuclear power programme

(Volume 2 - Appendices)

Ahmed Alali

A thesis submitted in partial fulfilment of the requirements
of the Nottingham Trent University and Southampton Solent
University for the degree of Doctor of Philosophy.

September, 2016

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APPENDIX 1: Research Questionnaire

1. Legal and liability issues

- a) Does the UAE have any specific national laws regarding nuclear liabilities?
- b) How can an actual claim be brought in the UAE?
- c) How long have the UAE nuclear energy laws been established?
- d) What are the current legal sources for provision of the UAE nuclear energy programme?
- e) Are the UAE's national laws regarding nuclear energy programme enacted in line or compliance with international legal instruments?
- f) What are the legal bases for the development of these laws?
- g) What is the specified role of the Emirates' Nuclear Energy Corporation (ENEC)?
- h) What legal principles does the ENEC follow (specifically as regards questions of potential liability)?
- i) What does a construction licence entail (areas of provision)?
- j) Do current regulations cover all aspects of liability? Is there scope for any improvement?
- k) How will UAE or the environment at large cope with the risks exceeding the insurance market's capacity?
- l) The 1997 Vienna Convention does clearly expand the geographical coverage of damage and leaving direct control on the Installation State; and while extending the definition of damage, it leaves sufficient caution to the laws of the Installation State, how does this impact UAE?
- m) In the Gulf region, is there need for a neutral tribunal for settlement of claims?
- n) Many significant countries like UK and France are not signatories to the Joint Protocol and are not linked to Vienna Convention parties by treaty system. Are there any problems for the UAE or gulf region or Middle East if they do not ratify?
- o) How will the compensation to residents of a non-contracting party be handled, if there is any (nuclear) effect on the Gulf State or Middle Eastern State, because some of them are not contracting parties?
- p) How is the UAE going to manage liabilities arising from accidents that may arise from the nuclear plants?
- q) What considerations, if any, are given to the potential liability of nuclear operators, (A strict liability approach)?

- r) Who is going to be liable for any nuclear accidents arising from the proposed UAE's nuclear energy programme?
- s) In a situation where damage occurred to a nuclear shipment whilst it was out of the source country and on its way to the destination country (damage in transit), who will remain liable for any damage?
- t) What jurisdiction would apply in case of third party liabilities/operators liabilities?
- u) What are the financial arrangements in terms of the amounts to be paid to victims of possible nuclear accidents?
- v) What is the time limit, if any, for liability?
- w) In the transportation of nuclear and related cargo, both the shipper handling the cargo and the owner holding title to the shipment bear responsibility for the safe transportation of the consignment to its destination. In the present instance, will the UAE government bear ultimate responsibility for ensuring the safe handling of the cargo?
- x) What about liabilities in countries like India or South Korea what impact does it have on UAE?
- y) What exactly amounts to a nuclear accident or incident?
- z) What is the limit, if any, for any compensation awards?

2. Political issues

- a) How would you rate your knowledge and understanding of the UAE nuclear energy programme?
- b) What is the UAE's involvement in the management of the nuclear plants in terms of funding and management?
- c) Why did ENEC select KEPCO and the Advanced Power Reactor 1400 MWe (APR1400) for its programme?
- d) How will the nuclear power plant in Abu Dhabi actually operate?
- e) What are the levels of involvement of the USA and UK in the UAE's nuclear programme?
- f) Does it really matter that communities in the region would be affected by building a nuclear plant near them?
- g) Will the UAE be re-processing or enriching fuel?
- h) To what extent would you agree that the UAE should decide not to enrich or reprocess used fuel?
- i) What are the plans for the local people where the plants are located?

3. Economic issues

- a) Why did the UAE decide to pursue nuclear energy?
- b) How does nuclear energy compare to other sources of electricity in terms of fuel efficiency, cost and stability?
- c) How does a nuclear energy plant produce electricity?
- d) How will these communities benefit economically from this nuclear power plant?
- e) Is there an expanding plan for nuclear energy stations in other cities?
- f) Is there a detailed cost-benefit plan devised to support the arguments for development of nuclear energy?

4. Safety and Security and Environmental issues

- a) Are nuclear energy plants safe?
- b) Is it safe to live near to, or work within, a nuclear energy plant?
- c) Who will license radioactive sources?
- d) What are the safety design features in a nuclear reactor?
- e) What will you do with nuclear waste - will it be stored?
- f) How is the UAE going to transport waste from the nuclear plants?
- g) Which country are the nuclear wastes going to be transported to?
- h) How is the UAE going to manage environmental concerns arising from the nuclear plants?
- i) What is the potential impact of nuclear materials in the marine environment?
- j) How does nuclear energy compare with other energy sources in terms of environmental impact?
- k) What systems do you have in place in case of emergency?
- l) Who is responsible for the security of the plants?

APPENDIX 2a: Letter of approval by the research supervisory team to administer research questionnaire

<p>To Whom it may Concern 26th June 2013</p>	 <p>Southampton SOLENT University</p>
<p>Re: Ahmed Alali</p>	
<p>Dear Madam or Sir,</p>	
<p>I write on behalf of Ahmed Alali, who is currently engaged as a doctoral research student in the area of the UAE Nuclear Energy Law. He is investigating the approach adopted by the UAE to the development of a peaceful nuclear energy programme and, as a consequence, has a need to investigate current developments both within the UAE and the UK.</p>	
<p>Mr Alali is sponsored by the Ministry of Higher Education in relation to his PhD studies at Southampton Solent University. He has made excellent progress in his research and has now reached a crucial stage in making a detailed analysis of the nature and scope of the UAE's nuclear energy law with comparison to the international legal system, and the internationally accepted rules of energy law.</p>	
<p>It would be very positive and helpful if he was able to undertake an interview or discussion with appropriate officials from your institution in those areas where his research is relevant. To this end, I would request that all available assistance can be provided for Mr Alali to enable him to secure such appropriate interviews with those officials. Mr Alali has produced a set of suggested areas of coverage in the form of some directed questions which he hopes to use as the basis of discussion.</p>	
<p>We do appreciate that the information sought can be very sensitive, and I hope to reassure you that we, and Southampton Solent University, will give every assurance that all information and sources will be treated with the strictest confidence, and that any information acquired will be utilised solely in the development and production of Mr Alali's research thesis. Guidance on the Southampton Solent University ethics policy can be located on their website at http://docman.solent.ac.uk/DocMan8/rms?RNS=ASQS/AH/1234569791</p>	
<p>Please feel free to contact me should you have any queries about Mr Alali's request. I would be happy to provide any assistance to you in the hope that you can in turn provide every assistance to him.</p>	
<p>Yours faithfully, </p>	
<p>Philip Jones PhD Supervisor School of Law Tel: +44 (0)23 80 319 509 Email: Philip.jones@solent.ac.uk</p>	
<p>East Park Terrace Southampton SO14 0YN UK Telephone + 44 (0)23 8031 9000 Fax + 44 (0)23 8022 2259 www.solent.ac.uk</p>	

APPENDIX 2b: Recommendation Letter fro The Chhief Scientist at FANR

Mail

COMPOSE

Inbox (7)
Starred
Sent Mail
Drafts (2)

More labels

Search people...

Abdulla Al Sadhan
Dr. Ahmed bin Al Ali
Hamad Abdulrazaq
klascena Olesco
nalali
Rafaa Mustafa
shahinaz Ahmed

Sent from my iPhone

Begin forwarded message:

From: "Farouk El Tawila (FANR)" <farouk_eltawila@fanr.gov.ae>

Date: 29 September 2016 at 12:54:55 BST

To: "a.smail@hotmail.com" <a.smail@hotmail.com>

Subject: RECOMMENDATION

It was a great pleasure having met you when you came for an interview at the United Arab Emirates' Federal Authority for Nuclear regulation. I would like to take this opportunity to thank you again for the interview and dialog that occurred in July 2013. It was very productive and we appreciated your suggestions and ideas presented during the interview.

Your ideas were valuable to us and positively reflects on your vision of the future of the UAE nuclear programme. I'm confident of your ability to apply these skills and knowledge toward completing your Ph.D.

Wish you all the best in your coming future.


Regards,


FANR

الهيئة الاتحادية للرقابة النووية

Federal Authority for Nuclear Regulation

هيئة اتحادية | Federation





فاروق الطويلة

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أبوظبي، الإمارات العربية المتحدة

Abu Dhabi, United Arab Emirates

www.fanr.gov.ae



Ask me anything

Fwd...

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Skype

MS...

Mic...

7

APPENDIX 3: Certificate of Competent Authority for Radioactive Material Package Design Source: UAE Federal Authority for Nuclear Regulation (FANR).



CERTIFICATE OF COMPETENT AUTHORITY FOR RADIOACTIVE MATERIAL PACKAGE DESIGN

- | | |
|-------------------------------|--|
| 1. CERTIFICATE NUMBER: | UAE/0001/AF-96 (Rev 0) |
| 2. EXPIRY DATE: | 1 Jan 2018 |
| 3. ISSUED TO: | KEPCO Nuclear Fuel Co., Ltd.
989 Beon-Gil, Daedeok-daero, Yuseong-gu, Daejeon,
305-353, Korea www.knfc.co.kr |
-

The Federal Authority for Nuclear Regulation (FANR), certifies that the package described below has been demonstrated to meet the regulatory requirements for the packaging for fissile radioactive materials as described in FANR regulations, FANR-REG-13 "*Regulation for the Safe Transport of Radioactive Materials*" and IAEA Safety Requirements TS-R-1, "*Regulations for the Safe Transport of Radioactive Material*", 2009 Edition.

4. PACKAGE IDENTIFICATION: HERMES-L (from certificate ROK/0040/AF-96(Rev 2))

5. PACKAGE DESCRIPTION AND AUTHORIZED RADIOACTIVE CONTENTS:

- | | |
|-------------------------------------|---|
| [1] Description: | HERMES-L may carry up to two (2) unirradiated uranium dioxide fuel assemblies for an APR1400 nuclear power plant. |
| [2] Drawings: | |
| [3] Contents: | HERMES-L packaging is manufactured in accordance with KEPCO Nuclear Fuel Co., Ltd, Drawing No. A0-7A7D2-951-P01.

Unirradiated uranium in the form of uranium dioxide fuel pellets contained within fuel rods. The |
| [4] Criticality Safety Index (CSI): | Zero (0)

The criticality safety analysis of the package is documented in "Request for FANR's Multilateral Approval of the Fresh Fuel Shipping Cask", Enclosure 3, dated 27 April 2012, and "Safety Analysis Report for the HERMES PWR Fresh Fuel Shipping Package", Rev C. |

[5] QA Requirements

The QA requirements are documented in "Request for FANR's Multilateral Approval

of the Fresh Fuel Shipping Cask", Enclosure 4, dated 27 April 2012.

6. CONDITIONS:

- a. Each user of the HERMES-L package must have in its possession a copy of this certificate and all relevant documents necessary to properly prepare the package for transportation.
- b. Each user must prepare the HERMES-L package in accordance with the relevant documentation and FANR applicable regulations.
- c. This certificate does not relieve the consignor or carrier from compliance with any of the requirements of the government ny-csuatry-through or into which the package will be transported.

William D. Travers
Director General
Issued in Abu Dhabi
24 December 2012

**APPENDIX 4: Licence for the Construction of a Nuclear Facility Source:
United Arab Emirates Federal Authority for Nuclear Regulation (FANR)**

**United Arab Emirates Federal Authority for Nuclear
Regulation**

**License No: FANR/NF/2010/001
License for Selection of a Site for the Construction of a Nuclear
Facility**

Under the powers provided in Articles (6) and (28) of Federal Law by Decree No. 6 of 2009 Concerning the Peaceful Uses of Nuclear Energy (the **Law**), the Federal Authority for Nuclear Regulation (the **Authority**) hereby issues a licence to:

The Emirates Nuclear Energy Corporation (ENEC)

Being a corporation established by Abu Dhabi Law Number 21 of 2009.

This license authorizes ENEC to conduct the following Regulated Activity set forth in Article (25) 1 of the Law:

Selection of a Site for the Construction of a Nuclear Facility.

This site selection license (this **License**) is subject to the conditions set out in Schedule 3.

This License shall continue in full force until suspended or revoked by the Authority or until surrendered by the Licensee.

This License comprises this page and the following Schedules:

Schedule 1: (1 page) Interpretation;

Schedule 2: (2 pages) Specification Required under Article (24) of the Law;

Schedule 3: (1 page) License Conditions;

Schedule 4: (1 page) Application Documents;

Issued at Abu Dhabi
This 28th of February, 2010

William D. Travers
Director General of the Federal Authority for Nuclear Regulation

Schedule 1

Interpretation

For purposes of this License, the following terms shall have the meanings set forth below. Other capitalized terms used but not defined herein shall have the meaning ascribed to them in Article (1) of the Law.

Selection of a Site for the Construction of a Nuclear Facility means only the regional analysis and identification of potential sites; screening of potential sites and identification of candidate sites; and evaluation of candidate sites so as to characterize fully the site-specific conditions pertinent to the Safety and security of a Nuclear Facility and activities reasonably associated with the foregoing.

Schedule 2

Specification Required under Article (24) of the Law

1. The Facilities, Activities or inventories of Sources covered by this License.

This License covers the Regulated Activity Selection of Site for the Construction of a Nuclear Facility as defined in Schedule 1.

2. The requirements for notifying the Authority of any modifications to Safety-related aspects.

License condition 2 in Schedule 3 sets out the requirements for notifying the Authority of any modifications to Safety related aspects.

3. The obligations of the Operator in respect of its Facility, equipment, Radiation Source(s) and Personnel.

The obligations of the Operator related to the site selection Activities are set out in Schedule 3.

Any use of Radiation Sources shall be subject to licensing by the Authority.

4. Any restrictions imposed on Operation and use (such as Dose or Discharge limits, action levels or limits on the duration of this License).

The duration of this License is specified in the body of this License, no other restrictions on Operation and use apply

5. Criteria and conditions for Radioactive Waste Processing for existing or foreseen Radioactive Waste Management Facilities.

No Radioactive Waste Processing is foreseen under this License.

6. Any additional authorizations that the Operator is required to obtain from the Authority.

As indicated in item 3 above the Operator is required to obtain a separate License for the use of Radiation Sources.

7. The requirements for incident reporting.

No requirements for incident reporting are foreseen under this License.

8. Criteria of the reports that the Operator is required to submit to the Authority.

Criteria of the reports that the Operator is required to submit are set forth in License condition 5 in Schedule 3.

9. The records that the Operator is required to retain and the time periods for which such records must be retained.

The obligations of the Operator related to the recording of Activities are set out in License condition 7 in Schedule 3.

10. Emergency Preparedness.

No Emergency Preparedness provisions are foreseen under this License.

11. Any other requirements determined by the Authority in implementing regulations.

There are no other requirements beyond those specified in the License conditions in Schedule 3.

Schedule 3

License Conditions

1. ENEC shall conduct the Activities authorized by this License in accordance with:

- a. the Law;
- b. any applicable regulations issued by the Authority pursuant to the Law;
- c. the terms and conditions of this License;
- d. the documents referenced in and/or submitted with ENEC's application for this License (the Application Documents).

2. ENEC shall notify the Authority of any modification to Safety-related aspects of the Application Documents at least 30 days prior to their implementation. Such modifications shall be subject to the Authority's re-assessment and approval.

3. ENEC shall provide the Authority with a plan and timetable for specific Activities to be undertaken under the general authority of this License at least 30 days prior to such Activities commencing.

4. ENEC shall provide the Authority with access to any place, to any document or to any authorized person, and shall provide all assistance necessary to enable the Authority to inspect the licensed Activity in accordance with Articles (5), (35) and (36) of the Law.
5. ENEC shall provide to the Authority within one month of the end of each calendar year a report on the Activities carried out under this License during the previous year.
6. ENEC shall obtain any necessary licenses, permits and authorizations from any other competent authority prior to conducting any Activities authorized by the Authority under this License.
7. ENEC shall retain any Safety-related information gathered and recorded during the site selection process for the life time of the Nuclear Facility.

Schedule 4

APPLICATION DOCUMENTS

Applicant's Documents Used as a

Basis for the Review

1. License for the Selection of a Site for the Construction of a Nuclear Facility ENEC/FANR/10/0001L/LNP, February 2, 2010, including four enclosures and one attachment.

APPENDIX 5: UAE Federal Law by Decree No. 4 of 2012 Concerning Civil Liability for Nuclear Damage. Source: UAE Federal Authority for Nuclear Regulation (FANR).

PRIVILEGED & CONFIDENTIAL

Unofficial Translation

**FEDERAL LAW BY DECREE NO. 4 OF 2012
CONCERNING CIVIL LIABILITY FOR NUCLEAR DAMAGE**

We, Khalifa bin Zayed Al Nahyan, President of the United Arab Emirates,

- Having reviewed the Constitution;
- Federal Law No. 1 of 1972 Concerning the Jurisdictions of the Ministries and the Competences of the Ministers, and the amending laws thereof;
- Federal Law by Decree No. (6) of 2009 Concerning the Peaceful Uses of Nuclear Energy;
- Federal Decree No. 32 of 2012 Ratifying the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage of 1997; and
- Federal Decree No. 33 of 2012 Ratifying the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention of 1988; and
- Acting upon the proposal of the Minister of Energy and the consent of the Cabinet, have issued the following Federal Law by Decree:

DEFINITIONS

Article (1)

In the implementation of the provisions of this Law by Decree, and regardless of provisions of any other legislation, the following terms and phrases shall have the meanings set forth below unless the context requires otherwise:

State: The United Arab Emirates.

Authority: Federal Authority for Nuclear Regulation.

IAEA: International Atomic Energy Agency.

Operator: The person licensed by the Authority to operate a Nuclear Installation pursuant to Federal Law by Decree No. (6) of 2009 and designated as the Operator in such license.

Nuclear Fuel: Any material which is capable of producing energy by a self-sustaining chain process of nuclear fission.

Radioactive Products or Waste: Any radioactive material produced in, or any material made radioactive by exposure to the radiation incidental to, the production or utilization of Nuclear Fuel, but does not include radioisotopes which have reached the final stage of fabrication so as to be usable for any scientific, medical, agricultural, commercial or industrial purpose.

Nuclear Material:

- (1) Any Nuclear Fuel, other than natural uranium and depleted uranium, capable of producing energy by a self-sustaining chain process of nuclear fission outside a Nuclear Reactor either alone or in combination with other material.
- (2) Radioactive Products or Waste.

Nuclear Reactor: Any structure containing Nuclear Fuel in such an arrangement that a self-sustaining chain process of nuclear fission can occur therein without an additional source of neutrons.

Nuclear Installation:

- (1) Any Nuclear Reactor other than one with which a means of sea or air transport is equipped for use as a source of power, whether for propulsion thereof or for any other purpose.
- (2) Any factory using Nuclear Fuel for the production of Nuclear Material, or any factory for the processing of Nuclear Material, including any factory for the re-processing of irradiated Nuclear Fuel.
- (3) Any facility where Nuclear Material is stored, other than those storehouses used to store Nuclear Material during carriage.
- (4) Other facilities in which there are Nuclear Fuel or Radioactive Products or Waste as the Board of Governors of the IAEA shall from time to time determine.

Several Nuclear Installations of one Operator which are located at the same site shall be considered as a single Nuclear Installation.

Nuclear Damage:

- (1) Loss of life or any personal injury;
- (2) Loss of or damage to property;
- (3) Economic loss arising from loss or damage not referred to in paragraphs (1) or (2) above, incurred by a person entitled to claim for compensation in respect of such loss or damage;
- (4) The costs of measures of reinstatement of impaired environment, unless such impairment is insignificant, if such measures are actually taken or to be taken, and insofar as not included in paragraph (2) above;
- (5) Loss of income deriving from an economic interest in use or enjoyment of the environment, incurred as a result of a significant impairment of that environment, and insofar as not included in paragraph (2) above;
- (6) The costs of preventive measures, and further loss or damage caused by such measures;
- (7) Any other economic loss, other than loss caused by the impairment of the environment,

to the extent that the loss or damages referred to in paragraphs 1-5 and 7 above have emerged from or resulted from ionizing radiation emitted from any radiation source within a Nuclear Installation, or emitted from Nuclear Fuel, Radioactive Products or Waste in a Nuclear Installation, or of Nuclear Material coming from, originating in or sent to a Nuclear Installation,, whether arising from the radioactive properties of such material or from a combination of radioactive properties with , toxic, explosive or other hazardous properties of such material.

The Cabinet may issue instructions related to the implementation of the provisions of paragraphs 1-7.

Nuclear Incident: Any occurrence or series of occurrences having the same origin which causes Nuclear Damage or creates a grave and imminent threat of causing such damage only with respect to preventive measures.

Special Drawing Right (SDR): The unit of account as defined by the International Monetary Fund and used by it for its own operations and transactions.

1997 Vienna Convention: The consolidated text of the 1963 Vienna Convention as amended and attached to the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage dated 12 September 1997.

OBJECTIVES OF LAW

Article (2)

The objective of this Federal Law by Decree is to:

- (1) Regulate the provisions and determine the scope of the civil liability and compensation for Nuclear Damage.
- (2) Determine the financial security that the Operator must maintain.
- (3) Apply the 1997 Vienna Convention on Civil Liability for Nuclear Damage wherever no provision is made in this Law by Decree.

SCOPE OF APPLICATION

Article (3)

The Operator of a Nuclear Installation shall be absolutely liable for damages upon proof that such damage has been caused by a Nuclear Incident as described in Article II of the 1997 Vienna Convention.

The Authority may, if the small extent of the risks involved so warrants, exclude any Nuclear Installation or small quantities of Nuclear Material from the application of this Law by Decree, provided that:

- (1) With respect to Nuclear Installations criteria for such exclusion have been established by the Board of Governors of the IAEA and the Authority issues a resolution that such exclusion satisfies such criteria.
- (2) With respect to small quantities of Nuclear Material, maximum limits for the exclusion of such quantities have been established by the Board of Governors of the IAEA and the Authority issues a resolution that such exclusion is within such established limits.

LIABILITY FOR NUCLEAR DAMAGE

Article (4)

The Operator is solely liable for any Nuclear Damage caused by a Nuclear Incident, in accordance with the provisions of Article II of the 1997 Vienna Convention.

Article (5)

- (1) The liability of the Operator to compensate for Nuclear Damage for any one Nuclear Incident shall not exceed 450 million SDRs.
- (2) The Authority, having regard to the nature of the Nuclear Installation or the Nuclear Material involved and to the likely consequences of an incident originating therefrom, may establish a lower limit for the liability of the Operator for compensating for Nuclear Damage referred to in paragraph (1) of this Article in relation to Nuclear Installations consisting of research reactors, low-power reactors and facilities that process or store Nuclear Material, provided that in no event shall any amount so established be less than 5 million SDRs. The State shall ensure coverage of the difference between the lower limit which the Authority establishes pursuant this paragraph and the higher liability limit set forth in paragraph (1) of this Article.

Article (6)

Upon the request of a carrier of Nuclear Material or a person handling Radioactive Products or Waste, and with prior written consent of the Operator, the Authority may designate or recognize him as an Operator in place of the Operator identified by the Authority, solely for purposes of Article II of the 1997 Vienna Convention and upon compliance with the insurance and financial security coverage requirements set forth in Article 8 of this Law by Decree.

In this event, such carrier or such person referred to in the first paragraph of this Article shall be considered as an Operator of a Nuclear Installation situated in the territory of the State.

Article (7)

If the Operator proves that the Nuclear Damage resulted wholly or partly either from the gross negligence of the person suffering the damage or from an act or omission of such person done with intent to cause damage, the court may relieve the Operator wholly or partly from the obligation to pay compensation in respect of the damage suffered by such person.

FINANCIAL SECURITY AND INSURANCE

Article (8)

- (1) The Operator shall obtain and maintain insurance and guarantees required by the Authority with respect to its liability for Nuclear Damage.
- (2) For the purposes of issuing a license to operate a Nuclear Installation, the Operator of the Nuclear Installation shall obtain and maintain insurance or other financial security up to 450 million SDRs, or up to the limit which the

Authority may determine in accordance with the provisions of paragraph (2) of Article 5 of this Law by Decree, to cover his liability for any one Nuclear Incident, provided that this insurance or other financial security shall be of such type and on such terms as approved by the Authority.

- (3) The Operator may obtain the insurance or the financial security from any sources approved by the Authority within or outside of the State.
- (4) The provisions of this Law by Decree complies with the priority in the distribution of compensation given to claims for loss of life or personal injury set forth in paragraph (2) of Article VIII of the 1997 Vienna Convention.
- (5) If the Operator is not able, after exhausting all efforts, to obtain insurance coverage or any part thereof referred to in paragraph (2) of this Article, the Authority may determine that the required insurance under the provisions of this Law by Decree is not available in domestic or international insurance markets, or that the insurance coverage is not available or is temporarily suspended. In these cases, the risks covered under the insurance coverage will be covered directly by the State, up to the limit provided for in paragraphs (1) or (2) of Article 5 of this Law, as the case may be, until such time as the Authority announces the availability of the insurance coverage and gives the relevant parties a period of time set by the Authority, upon it sole discretion, to obtain such insurance.

Article (9)

- (1) An Operator shall provide the carrier with a certificate issued by or on behalf of the insurer or any other financial guarantor furnishing financial security pursuant to Article 8 of this Law by Decree.
- (2) The certificate referred to in the first paragraph of this Article shall comply with the requirements set forth in this Law by Decree and with Article III of the 1997 Vienna Convention.
- (3) This Article shall not apply to transportation which occurs wholly within the territory of the State.

ACTIONS FOR COMPENSATION

Article (10)

- (1) Actions for compensation for Nuclear Damage shall be brought only against the Operator or the person furnishing insurance or financial security pursuant to paragraph (1) of Article 8 of this Law by Decree.

- (2) Action for compensation against the Operator shall lapse on the expiry of valid insurance or financial security if it continues to be valid for a period longer than the period set forth in paragraph 1(a) of Article VI of the 1997 Vienna Convention
- (3) The rights for claiming compensation of any person who suffered Nuclear Damage shall expire if an action is not brought within three years from the date on which the person suffering damage had knowledge, or ought reasonably to have had knowledge of the damage and of the Operator liable, provided that the periods established pursuant to paragraph 1(a) of Article VI of the 1997 Vienna Convention or paragraph (2) of this Article have not been exceeded.

Article (11)

The Operator shall have the right of recourse in the following two cases:

- (1) If this is expressly provided for in a contract in writing.
- (2) If the Nuclear Incident results from an act or omission done with intent to cause damage. In such case the action shall be brought against the person who acted or participated in causing the act or omitted to act with such intent.
- (3) The recourse provided for under this Article may extend to benefit the State insofar as it has provided public funds pursuant to 1997 Vienna Convention.

JURISDICTION

Article (12)

- (1) The Federal Courts in the Emirate of Abu Dhabi shall have exclusive jurisdiction over actions arising pursuant to this Law by Decree.
- (2) The provisions of this Law by Decree shall apply to actions related to civil liability for Nuclear Damage. The provisions of the 1997 Vienna Convention shall apply wherever no provisions are made in this Law by Decree.
- (3) Upon the submission of an action for compensation for Nuclear Damage under the jurisdiction of the court referred to in the paragraph 1 of this Article, the court may appoint one or more specialists or experts to assist the court in accordance with the applicable laws and legislation.

COMPETENT AUTHORITY

Article (13)

The Authority shall be the competent authority with respect to implementation of the provisions of this Law by Decree, including:

- (1) Determining whether to exempt small quantities of Nuclear Material or Nuclear Installations from application of the provisions of the 1997 Vienna Convention and Article 3 of this Law by Decree;
- (2) Determining the lower limit of liability in the case of Nuclear Installations consisting of research reactors, low-power reactors and facilities that process or store Nuclear Material, pursuant to paragraph (2) of Article 5 of this Law by Decree; and
- (3) Determining whether the civil liability insurance or any other financial security of the applicant or the Operator is in accordance with the terms of financial protection required by paragraph 1(a) of Article VII of the 1997 Vienna Convention and paragraphs (1) and (2) of Article 8 of this Law by Decree.
- (4) Issuing rules and regulations relating to the application of provisions of this Law by Decree.

GENERAL PROVISIONS

Article (14)

- (1) Nothing in this Law by Decree shall be construed as limiting or restricting any right or obligation of any person arising under any scheme or system of health insurance, employees' compensation or occupational disease compensation. A beneficiary of any scheme or system of insurance or compensation referred to in paragraph (1) of this Article shall be eligible for the compensation provided in this Law by Decree in accordance with its terms.

Article (15)

This Law by Decree shall be published in the Official Gazette and shall come into force on the date of its publication.

Khalifa bin Zayed Al Nahyan President of the United Arab Emirate
Issued at the Presidential Palace in Abu Dhabi
Date: 25 Ramadan 1433 A.H.
Corresponding to: 13 August 2012 A.D.

Appendix 6: UAE Federal Law by Decree No. 6 of 2009 Concerning a Peaceful Uses of Nuclear Energy Source: UAE Federal Authority for Nuclear Regulation (FANR).

Unofficial Translation

A FEDERAL LAW BY DECREE NO. 6 OF 2009

CONCERNING THE PEACEFUL USES OF NUCLEAR ENERGY

We, Khalifa Bin Zayad Al Nahyan, President of the United Arab Emirates,

- Having reviewed the provisions of the Constitution, and
- Federal Law No, (1) of 1972 Regarding the Functions of Ministries and Powers of Ministers and the amending laws thereof;

Federal Law No. (8) of 1984 Regarding Commercial Companies and the amending laws thereof;

Federal Law No. (5) of 1985 Issuing the Civil Transactions Code and the amending laws thereof;
- Federal Law No. (3) of 1987 Issuing the Penal Code and the amending laws thereof;

Federal Law No. (10) of 1992 Issuing the Law of Evidence in Civil and Commercial Transactions and the amending laws thereof;

Federal Law No (24) of 1999 Regarding the Protection and Development of the Environment and the amending laws thereof;

Federal Law No. (1) of 2002 Regarding the Regulation and Control of the Use of Radiation Sources and Protection Against their Hazards and the amending laws thereof;

Federal Law No (13) of 2007 Concerning the Commodities Subject to the Export and Import Control and the amending laws thereof;

Federal Law by Decree No (11) of 2008 Concerning the Human Resources in the Federal Government;

Federal Decree No (38) of 1996 Concerning The Treaty on the Non-Proliferation of Nuclear Weapons (1968);
- Federal Decree No. (84) of 2000 regarding the Comprehensive Nuclear Test Ban Treaty (1996) and the protocol thereto;

Federal Decree No. (66) of 2003 regarding the Convention on the Physical Protection of Nuclear Material;

Federal Decree No. (46) of 2003 regarding the Agreement between the United Arab Emirates and International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons and the Additional Protocol (2009): and

Federal Decree No. (95) of 2007 regarding the International Convention for the Suppression of Acts of Nuclear Terrorism:

on the basis of the proposal of the Minister of Energy and the agreement of the Council of Ministers, we have issued the following Law by Decree:

Chapter One

DEFINITIONS- JURISDICTION

Article (1)

In applying this Law by Decree, the following terms shall have the following meanings unless the context specifies otherwise.

Accident	Any intended or unintended event, including operating errors, equipment failures, initiating events, accident precursors, near misses or other mishaps, or unauthorized act, malicious or non-malicious, the consequences or potential consequences of which are not negligible from the point of view of protection or Safety.
Activity	The production, use, import and export of Radiation Sources for industrial, research and medical purposes; the transport of Radioactive Material; the Decommissioning of Facilities; and Radioactive Waste Management activities.
Assessment	The process and the result of a systematic analysis and the evaluation of the extent of hazards associated with Regulated Activities and Regulated materials and associated protection and Safety measures for the purpose of meeting requirements, achieving efficiency of the process and encouraging improvements including safety improvements.
Assessment Activities	Includes reviewing, checking, inspecting, testing, surveillance, auditing, peer evaluation and technical review activities, which can be carried out either through independent assessment or Self-assessment.
Board	The board of management of the Authority.
Chairman	The chairman of the Board.

Closure	Administrative and technical actions directed at a repository at the end of its operating lifetime - such as covering of the disposed waste (for a near surface repository) or backfilling and/or sealing (for a geological repository and the passages leading to it) - and the termination and completion of activities in any associated structures.
Commissioning	The process by means of which systems and components of Facilities and Activities, having been constructed, are made operational and verified to be in accordance with the Design and to have met the required performance criteria. Commissioning may include both non-nuclear and/or non-radioactive and nuclear and/or radioactive testing.
Construction	The process of manufacturing and assembling the components of a Facility, the carrying out of civil works, the installation of components and equipment and the performance of associated tests.
Decommissioning	Administrative and technical actions taken to allow the removal of some or all of the Regulatory Controls from a Nuclear Facility (except for a Radioactive Waste Repository or for certain Nuclear Facilities used for the Disposal of residues from the mining and processing of Radioactive Material, which are closed and not decommissioned).
Design	The process of developing a concept, detailed plans, supporting calculations and specifications for a Facility or one of its parts..
Director General	The director general of the Authority.
Discharge	Planned and controlled release of (with or gaseous, liquid or otherwise) Radioactive Material to the environment.
Disposal	Emplacement of waste in an appropriate Facility without the intention of retrieval.
Dose(s)	A measure of the energy deposited by radiation in a target.
Emergency/ies	A non-routine situation that necessitates prompt action, primarily to mitigate a hazard or adverse consequences for human health and Safety, quality of life, property or the environment. This includes nuclear and radiological emergencies and conventional emergencies such as fire, release of hazardous chemicals, storms or earthquakes. It includes situations for which prompt action is warranted to mitigate the effects of a perceived hazard.
Emergency Action	An action performed to mitigate the impact of an Emergency .

Emergency Plan	A description of the concept, policy and objectives of operations for the response to an Emergency and of the structure, authorities and responsibilities for a systematic, coordinated and effective response. The Emergency Plan serves as the basis for the development of other plans, procedures and checklists.
Emergency Preparedness	The capability to take actions that will effectively mitigate the consequences of an Emergency.
Emergency Response	The performance of actions to mitigate the consequences of an Emergency. It may also provide a basis for the resumption of normal social and economic activity.
Emergency Zone	The precautionary action zone and/or the urgent protective action planning zone.
Enforcement Action	actions taken by the Authority for the purpose of ensuring operator's compliance with this Decree by Law, regulation and requirements specified by the Authority, including corrective actions, written warnings, revoking of a license and any other administrative penalties or fines the authority may impose according to this Decree by Law ,and regulations in force. The Authority shall, when taking an Enforcement Action, take into consideration the suitability of the
Enrichment	A process or operation the purpose of which is to produce uranium containing a greater mass percentage of uranium - 235 than 0.72%
Exemption	The determination by the Authority that a Source or practice is exempted from some or all aspects of Regulatory Control on the basis that the exposure (including potential exposure) due to the Source or practice is too small to warrant the application of those regulatory aspects or that this is the optimum option for prevention irrespective of the actual level of the Doses or risks.
Facility	Includes Nuclear Facilities, irradiation installations, some mining and raw material processing facilities such as uranium mines; Radioactive Waste Management Facilities, and any other places where Radioactive Material is produced, processed, used, handled, stored or disposed of, or where
Government	The Government of the State.
IAEA	International Atomic Energy Agency.
IAEA Safety Standards	Standards of safety provided for in the Statute of the IAEA.
Inspection	An examination, observation, measurement or test undertaken to assess structures, systems and components and materials, as well as operational activities, technical processes, organizational processes, procedures and personnel.
Ionizing Radiation	Radiation capable of producing ion pairs in biological materials.

License	The approval issued by the Authority granting authorization to the Licensee to perform one or more specific Regulated Activities related to a Facility or Activity. Or any other authorization granted by the Authority to the applicant to have the responsibility for the siting, Design, Construction, Commissioning. Operation or Decommissioning of a nuclear installation or granted to carry out any Activity related to management of nuclear spent fuel or of Radioactive Waste.
Licensee	A Person holding a valid License
Maintenance	The organized activity, both administrative and technical, of keeping structures, systems and components in good operating condition, including both preventive and corrective (or repair) aspects.
Management System	A set of interrelated or interacting elements (system) for establishing policies and objectives and enabling the objectives to be achieved in an efficient and effective manner.
Nuclear Facility	A Facility including associated buildings and equipment in which Nuclear Material is produced, processed, used, handled, stored or disposed of including Radioactive Waste Repository.
Nuclear Fuel	Fissionable nuclear material in the form of fabricated elements for loading into the reactor core of a civil nuclear power plant or research reactor
Nuclear Material	Plutonium except that with isotopic concentration exceeding 80% in plutonium-238; uranium-233; uranium enriched in the isotope 235 or 233; thorium or uranium containing the mixture of isotopes as occurring in nature other than in the form of ore or ore residue; any material containing one or more of the foregoing.
Nuclear Reactor	A device in which nuclear fuel is used in to control nuclear fission reactions, and to sustain the required environment for controlled fission reactions without causing an explosion during chain reactions. It includes research and power reactors
Nuclear Safety	The achievement Of proper operating Conditions, prevention Of Accidents or mitigation of Accident consequences, resulting in protection of workers, the public and the environment from undue radiation hazards.
Nuclear Sector	The Sector related to the Regulated Activities.
Nuclear Security	The prevention and detection of. and response to, theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving Nuclear Material, other radioactive substances or their associated facilities.

Occupational Exposure(s)	Exposure of workers incurred in the course of their work, with the exception of excluded exposures and exposures from exempt practices or exempt Sources according to specifications set by the Authority.
Operation	All activities performed to achieve the purpose for which an authorized Facility, by the Authority, was constructed.
Operator	Any person authorized and/ or responsible for nuclear safety, radiation safety, Radioactive Waste or transport Safety when undertaking activities or in relation to any Nuclear Facilities or Sources of Ionizing Radiation. This includes, inter alia, individuals in their personal capacity, governmental bodies, consignors or carriers. Licensees, hospitals, self-employed
Orphan Sources	A Radioactive Source which is not under the Regulatory Control, either because it has never been under such Regulatory Control or because it has been abandoned, lost, misplaced, stolen or whose possession or ownership has otherwise been transferred in the absence of an appropriate License. A systematic reassessment of the Safety of an existing Facility.
Periodic Safety Review	(or Activity) carried out at regular intervals to deal with the cumulative effects of ageing, modifications, operating experience, technical developments and siting aspects, and aimed at ensuring a high level of Safety throughout the service life Of the Facility (or Activity).
Person	Natural or juridical persons whether in the public or private sector.
Physical Protection	Measures for the protection of Nuclear Material or authorized Facilities, designed to prevent unauthorized access or removal of fissile material or sabotage with regard to safeguards, as, for example, in the Convention on the Physical Protection of Nuclear Material or other related international agreements, to which the State is a party.
Processing	Any operation that changes the characteristics of waste, including pre-treatment, treatment and conditioning.
Public Exposure(s)	Exposure incurred by members of the public from Radiation sources, excluding any occupational or medical exposure and the normal local natural background radiation but including exposure from authorized sources and practices and from intervention situations.
Quality Assurance	The function of a Management System that provides confidence that specified requirements will be fulfilled.
Radiation Protection	The protection of people from the effects of exposure to Ionizing Radiation, and the means for achieving this.

Radiation Source	A radiation generator, or a Radioactive Source or other Radioactive Material outside the nuclear fuel cycles of research and power reactors.
Radioactive Material	Material designated by the Authority as being subject to Regulatory Control because of its radioactivity.
Radioactive Source	Radioactive Material that is permanently sealed in a capsule or closely bonded and in a solid form and which is not exempt from Regulatory Control. This also includes any Radioactive Material released if the Radioactive Source is leaking or broken, but does not include material encapsulated for Disposal, or Nuclear Material within the nuclear fuel cycles of research and power reactors.
Radioactive Source	Radioactive Material that is permanently sealed in a capsule or closely bonded and in a solid form and which is not exempt from Regulatory Control. This also includes any Radioactive Material released if the Radioactive Source is leaking or broken, but does not include material encapsulated for Disposal, or Nuclear Material within the nuclear fuel cycles of research and power reactors.
Radioactive Waste	Waste that contains, or is contaminated with, radionuclides at concentrations or activities greater than levels as established by the Authority.
Radioactive Waste Management	All administrative and operational activities involved in the handling, pretreatment, treatment, conditioning, transport, Storage and Disposal of Radioactive Waste.
Radioactive Waste Management Facilities	Facility specifically designated to handle, treat, condition, temporarily store or permanently dispose of Radioactive Waste,
Radioactive Waste Repository	A repository to deposit Radioactive Waste for disposal purposes.
Regulated Activities	The activities identified in Article 25 of this Law by Decree.
Regulated Material	Any Radioactive Material, special materials and equipment, Radioactive Waste, nuclear spent fuel and any other material, product, service or asset whether tangible or intangible which, in the opinion of the Authority, is or may in the future be related to or connected with the Nuclear Sector and designated as such from time to time by implementing regulations: and Any other Radioactive Material and Sources of Ionizing Radiation as designated by the Authority from time to time as requiring its direct oversight.
Authority	The Federal Authority for Nuclear Regulation.
Regulatory Control	Any form of control or regulation applied to Facilities or Activities by the Authority for reasons relating to Radiation Protection or to the Safety or security of Radioactive Sources.

Regulatory Inspection	Inspection undertaken by or on behalf of the Authority to ensure the Licensee's compliance with the provisions of this Law by Decree, the implementing regulation, regulation in force and the terms of the License.
Reprocessing	A process or operation, the purpose of which is to extract radioactive isotopes from nuclear spent fuel for further use.
Safeguards Agreement	The Agreement between the State and IAEA for the application of Safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons (2003) and the Protocol Additional to that Agreement (2009)
Safety	The protection of people and environment from exposure to Radiation risks, the safety of facilities including safety of nuclear facilities and radiation safety and safety of management of radioactive materials and the safety transport of radioactive material s, and the means for preventing Accidents and for mitigating the consequences of Accidents, and does not include safety aspects not related to radiation feild
Safety Assessment	Assessment of all aspects of a practice that is relevant to protection and Safety: for an authorized Facility, this includes siting, Design and Operation of the Facility. Analysis to predict the performance of an overall system and its impact, where the performance measure is the radiological impact or some other global measure of the impact on Safety. The systematic process that is carried out throughout the design process to ensure that all the relevant Safety requirements are met by the proposed (or actual) design. Safety assessment includes, but is not limited to, the formal Safety analysis required by the Authority.
Spent Nuclear Fuel	Nuclear fuel removed from a reactor following irradiation that is no longer usable in its present form
State	United Arab Emirates
Storage	The holding of Radioactive sources, nuclear spent fuel or Radioactive Waste in a Facility that provides for their/its containment, with the intention of retrieval.

Article (2)

1. This Decree by Law aims to develop and regulate the Nuclear Sector in the State towards peaceful purposes only in accordance with the Policy of the State on the Evaluation and Potential Development of Peaceful Nuclear Energy, the international treaties and the agreements acceded by the State in this regard. The development and regulation of the Nuclear Sector in the State will afford priority to Safety, Nuclear Safety, Nuclear Security, Radiation Protection and safeguards.
2. The Design, Construction, development and Operation of Facilities for Enrichment or Reprocessing shall be prohibited in the State.

Article (31

This Law by Decree shall apply in the State, including free zones, special zones,

Chapter Two

ESTABLISHMENT OF THE AUTHORITY AND ITS OBJECTS

Article (41

1. A public organization under the name of "Federal Authority for Nuclear Regulation" shall hereby be established with independent balance sheet and it shall have an independent legal personality, full legal competence and financial and administrative independence in all its matters.
2. The Authority aims to regulate and develop the Nuclear Sector in the State toward the peaceful purposes only and to ensure Safety, Nuclear Safety, Nuclear Security and Radiation Protection.
3. The headquarters of the Authority shall be in the city of Abu Dhabi, and it may establish branches or offices within the State by a decision from the Board thereof.

Article (5)

The Authority shall determine all matters relating to the control and supervision of the Nuclear Sector in the State, particularly those related to Safety, Nuclear Safety, Nuclear Security, Radiation Protection, Safeguards and implement any obligations under the relevant international treaties, conventions or agreements entered into by the State.

The Authority shall ensure the compliance with the prevention of the use of Nuclear Facilities and Nuclear Materials and technology for non-peaceful purposes in order to attain effective control of Safety, Nuclear Safety, Nuclear Security, Radiation Protection and Safeguards.

The Authority shall, for the purpose of carrying out its functions under this Law by Decree, have power to;

1. Carry out and support research and develop studies relevant to the scope of work of the Authority;
2. set up the procedure and measures that must be followed and, without prejudice to Safety requirements, reconsider the issued decisions by it;
3. coordinate with the competent authorities in the State to ensure nuclear nonproliferation and to liaise in relation to Nuclear Security;
4. establish and maintain a State system of accounting for and control of Nuclear Material in accordance with the requirements of the Safeguards Agreement;
5. establish and manage a special register of Radioactive Sources;
6. establish and operate a register of occupational Doses and of radioactive releases to the environment arising from Regulated Activities;
7. ensure that appropriate records relating to the Safety of Facilities and Activities are retained and easily retrievable
8. enter into the relevant sites and Facilities at any time to carry out an Inspection and to enable the Authority to perform its functions efficiently;
9. ensure the extent of the application of the regulatory requirements;
10. communicate directly with governmental authorities when necessary;
11. Clarify the regulatory and control requirements, decisions and opinions of the Authority to the public;
12. provide governmental bodies, national organizations, international organizations through the State's representatives and the public with information on Incidents and abnormal occurrences, and other information, as appropriate;
13. liaise and co-ordinate with other governmental bodies and expert firms having competence in such areas as health and safety, environmental protection, security, and transport of hazardous goods;
14. liaise with other regulatory bodies outside the State, international organizations through the State's representatives and expert firms to enhance the co-operation and the exchange of regulatory information in relation to nuclear energy;
15. review and assess submissions on Safety from Operators both prior and after the granting of a License;
16. ensure that corrective actions are taken if unsafe cases are detected;
17. take the necessary Enforcement Actions in the event of violations of Safety;

18. establish a process for dealing with applications, such as applications for the issuing of a License, accepting a notification or the granting of an Exemption from Regulatory Control;
19. provide guidance on developing and presenting Safety Assessments or any other required Safety related information to the Operator;
20. ensure that proprietary and security-related information is protected in accordance with the provisions of this Law by Decree;
21. provide information to governmental bodies, international organizations through the State's representatives and the public in accordance with the regulations issued for that purpose;
22. evaluate the operating experience in the area of Nuclear Safety for the benefit of the Authority's work ;
23. establish the requirements for systematic Safety Assessment or Periodic Safety Review and inform the Operator and ensure its compliance
24. advise and provide consultations to the government entities on matters related to Safety, Nuclear Safety, Nuclear Security and the activities of the Authority;
25. ensure the competence of the Operators personnel to operate the Facility and carry out the activities in safe means;
26. ensure that Nuclear Safety and Nuclear Security are managed effectively and accurately by the Operator;
27. ensure that the relationship with the Operator is based on transparency;
28. monitor radiation in the areas around Nuclear Facilities;
29. test the quality control measurements;
30. initiate, coordinate and follow up with other authorities Safety related research and development works;
31. Monitor radiological exposure and conduct independent medical examinations if necessary;
32. develop a strategy to ensure Radiation Protection from Orphan Sources; and
33. apply the Quality Assurance principals on all procedures related to its functions.

Article (61)

The Authority shall be exclusively responsible for issuing all Licenses to practice any of the Regulated Activities in the State and any other license stipulated in this Law by Decree, its implementing regulation or any other

regulation issued by the Authority or amending, suspending, revoking such Licenses or refusing to grant it, provided that such refusal is bereasoned. The Authority may impose conditions on Licenses pursuant to this Law by Decree, its implementing regulations and regulations issued hereby.

Article (71

The Authority shall co-operate with the relevant government entities, advise them, and provide information on matters related to Nuclear Security Radiation Protection and Security concerning following areas:

1. Environmental protection;
2. Public and occupational health;
3. Emergency planning and Emergency Preparedness;
4. Radioactive Waste;
5. Public liability (including the implementation of national regulations and international conventions concerning the liability of a third party);
6. Physical Protection and safeguards;
7. Water use and consumption of food;
8. Land use and planning; and
9. Safety in the transport of dangerous goods.

Article (81

The Authority shall examine and investigate any matter which appears to be a breach of this Law by Decree, the implementing regulation, regulations issued thereby, decisions of the Authority or any License condition of which it becomes directly aware of or through a third party.

Without prejudice to any other penalty prescribed by another law, the breaching Person shall indemnify the Authority against the costs and expenses incurred by the Authority in carrying out the investigation, and any fines or actions resulting from the investigation.

Article (91

(A) The Authority shall maintain the highest standards of transparency whilst performing its functions and towards this, it shall facilitate the public's access to all relevant information to its activities, in particular:

1. every License issued and every modification, suspension or revocation of a License;

2. information about licensing applications with regard to a Regulated Activity including the reasons for a decision to grant, grant with conditions or refuse a License;
3. all requirements on the conditional licensing and details of any derogation from performance of a condition of a License issued pursuant to this Law by Decree;
4. all applicable regulations and any amendments thereto;
5. all guidelines issued by the Authority pursuant to this Law by Decree;
6. summaries of the findings of each investigation and Inspection carried out by the Authority;
7. all penalties imposed for violation of the provisions of this Law by Decree, implementing regulations, regulations, decisions and instructions issued by the Authority; and
8. summaries of decisions granting a member or members of the Board authority to issue decisions pursuant to the provisions of this Law by Decree.
9. (B) As an exception, the Authority may restrict, conceal or amend any document or information it considers confidential or which may in its opinion unduly prejudice a Person or may prejudice the Nuclear Safety, Physical Protection, Nuclear Security or contains detailed technical or commercial information of a proprietary nature as classified by the Operator in accordance with the relevant measures issued by the Authority.

Chapter Three

THE MANAGEMENT OF THE AUTHORITY

Article 10

1. **The Authority shall be managed by** the Board comprising of not less than five members in addition to a Chairman, and a deputy Chairman. The Board shall be appointed by a resolution of the Cabinet for a period of three years renewable for other similar periods by the same appointing instrument.
2. The Board shall be constituted entirely by qualified nationals of the State. Such nationals shall not engage, whether directly or indirectly, in the conduct of any Regulated Activity and must not have any personal interest that conflicts the Authority interest.

3. The Board shall meet upon the Chairman's call once every two months at least, or whenever needed. No meeting of the Board shall be quorate unless the majority including the Chairman or his deputy are in attendance.
4. Decisions of the Board shall be taken by majority vote of attending members and, in the event of equal votes, the Chairman shall have a casting vote.
5. Meetings of the Board may take place in person, by conference call or by video-conference. The Board meetings shall be recorded and signed by the Chairman and the members of the Board.
6. The remuneration of Board members shall be determined by a resolution of the Cabinet.
7. The Director General shall, unless the Board decides otherwise, attend Board meetings, however without voting rights.
8. The Board shall issue its bylaws to regulate its meetings.

Article 11

The Board shall have the functions and authorities provided in this Law by Decree, implementing regulations, regulations and the decisions issued thereby, including:

- 1 set up the general policy of the Authority, its strategic plans and the appropriate agenda to execute the plans;
2. adopt the Authority's annual budget and balance sheet;
3. adopt the Authority's organizational structure;
4. issue the implementing, administrative, financial, technical, employment related regulations required for the Authority's operation and the requirements, criteria and measures related to its functions and the instructions and guidelines that govern the Authority, including;
 - a- to protect the individuals, society and the environment from radiation hazards, both for the present and in the future
 - b- specify what is excluded from the requirements of the Regulatory Control and to set up the relevant criteria and actions, provided that the potential magnitude and nature of the hazard associated with the Facility or Activity shall be taken into consideration;
 - c- specify the process for removal of a Facility or Activity from Regulatory Control;

d- specify the responsibility when Activities are carried out by several Operators successively and record the transfers of responsibility;

e- form advisory bodies to provide expert opinion and consultation to the Authority;

f- define the mechanism of involving government and private bodies to the regulatory process set by the Authority and specify the extent of the application of new requirements to existing Facilities and current Activities;

g- establish and develop the control and regulatory principals including the measures of Safety, Nuclear Safety and Nuclear Security and ensure its validity and adequacy in addition to its compliance with international measures and recommendations;

h- impose administrative fines and penalties for breaching the terms or conditions of a License pursuant to regulations endorsed by the Cabinet according to the Authority's recommendations;

i- Exercise Regulatory Control on the design of Facilities and Activities; and

j- establish, develop or adopt regulations and guidelines upon which its regulatory actions are based, including special regulations for Safety, Nuclear Safety, Nuclear Security, Radiation Protection, Emergency Preparedness, Emergency Response and Decommissioning.

5. propose the fees for Licenses and services provided by the Authority and submit it to the Cabinet for approval;
6. approve regulations related to work at the Authority, provided it is issued by the Chairman's resolution;
7. establish specialized technical committees and define their functions;
8. appointing the Director General of the Authority; and
9. any other functions designated to it by the Cabinet.

The Board may designate any of its powers to the Chairman or any member of the Board.

The Chairman shall submit at the end of each financial year a report, in relation to Authority's activities, to the Minister of the Presidential Affairs.

Article 12

1. A Board member may at any time resign his office by serving a notice to the Chairman, such notice shall not be less than sixty days and shall be referred to the Cabinet.
2. A Board member shall, unless the Board decides otherwise, be deemed to have given the required resign notice if he fails to attend three consecutive meetings of the Board without giving an acceptable justification for his absence.
3. Throughout their mandate and following the elapse of their membership. Board members shall not, without the Board's consent express any public position on matters that have come before the Board, a Board Member shall also maintain the confidentiality of proprietary or security-related information.

Article 13

1. A Board member shall be replaced, by a resolution of the Cabinet, for one of the following reasons:
 - a. physical or mental incapacity which prevents the Board member from carrying out his duties for more than ninety days, such incapacity shall be proved by the relevant medical committee in the State;
 - b. the Board member is convicted of Felony or misdemeanor related to honor or trust;
 - c. breach of any of the conditions stated in this Law by Decree; and
2. A Board member may be replace for maladministration serious misconduct or when carrying out any conduct that contravenes the interests of the Authority.

Article 14

The Board shall appoint a Director General to exercise the functions specified in this Law by decree, implementing regulations, regulations issued thereby and the resolutions issued by the Board.

Article 15

The Director General shall manage the Authority's business and oversee its financial, administrative and technical affairs under the Board's control. The Director General shall represent the Authority before the courts and third parties and shall also:

1. propose the general policy of the Authority and its strategic and operational plans for the Board's approval;
2. prepare and the submit to the Board the Authority's annual budget and the balance sheet;
3. propose the organizational structure and relevant regulations related to work at the Authority;
4. coordinate with other entities within the state and abroad in relation to the Authority's work and activities;
5. review all License applications and make appropriate recommendations to the Board;
6. propose the amendment and revocation of a Licenses;
7. propose and submit to the Board for approval policies for the protection of confidential information held by the Authority;
- B. delegate to senior staff the appropriate powers granted to the Director General pursuant to this Law by Decree, implementing regulations or the resolutions issued thereby; and
 - d. Implement the decisions taken by the Board and carry out other duties designated to the Director General of the Board.

Article 16

The Director General shall be replaced for one of the following reasons:

- a. physical or mental incapacity which prevents the Director General from carrying out his duties for more than ninety days, such incapacity shall be proved by the relevant medical committee in the State;
- b. the Director General is convicted of any Felony or misdemeanor related to honor or trust;
- c. proved maladministration or serious misconduct of the Director General or carrying out any activity which contravenes the interests or objectives of the Authority;
- d. for requirements of public interest; and
- e. Expiry of his appointment term.

Article 17

- I. The Authority shall appoint its employees according to the applicable regulations and decisions.

Chapter Four

FINANCIAL AFFAIRS OF THE AUTHORITY

Article 18

The Authority shall be entitled to receive all funds allocated to it and shall be free to deal with its funds and income, including opening and managing bank accounts in its own name and withdrawal there from according to auditing and financial regulations applicable in the Authority. The Authority's funds shall consist of the following:

1. funds allocated to it by the Government;
2. income generated by carrying out its functions; and
3. Gifts, grants and loans which the Board resolves to accept and do not conflict with the Authority's objectives.

Article (19)

The financial year of the Authority shall commence on the 1st January and end on the 31st December of each year; notwithstanding this, the first financial year of the Authority shall commence upon this Law by Decree becoming effective and shall end on the 31st December of the following year.

Article (20)

1. The Authority shall be subject to the provisions of the tender and procurement laws applicable in it.
2. The Authority shall manage its financial resources according to the applicable financial and auditing regulations in it.

Article 21

The Authority shall be exempt from all federal taxes, including custom duties in relation to material, machinery, equipment and spare parts imported for the purposes of achieving its objectives.

Article (221

The Board shall appoint an independent auditor registered with the appropriate authorities in the State to audit the annual accounts of the Authority and prepare reports regarding the results of the audit. The Authority shall submit a copy of it audited accounts, after the Board approves them, with a copy of the auditors report attached there, to the Cabinet for endorsement.

Chapter Five

LICENCES

{Granting- Revocation- Suspension}

Article 23

1. It is prohibited for any person to conduct any Regulated Activity in the State including free zones, unless licensed to do so by the Authority.

No License shall be issued unless for juridical persons approved by the competent authorities in the State.

3. It shall be prohibited to conduct any activity in the surrounding areas of Nuclear Facilities which may affect the operation of such Facilities. The applicable regulations shall determine the scope of these areas, licensing requirements and activities that may affect the safety operation of the facilities.

Article (24)

The License issued by the Authority shall specify:

1. the Facilities, Activities or inventories of Sources covered by the License;
2. the requirements for notifying the Authority of any modifications to Safety related aspects;
3. the obligations of the Operator in respect of its Facility, equipment, Radiation Source(s) and personnel;
4. any restrictions imposed on Operation and use (such as Dose or Discharge limits, action levels or limits on the duration of the License);
5. criteria and conditions for Radioactive Waste Processing for existing or foreseen Radioactive Waste Management Facilities;
6. any additional authorizations that the Operator is required to obtain from the Authority;
7. the requirements for Incident reporting;

8. Criteria of the reports that the Operator is required to submit to the Authority;
9. the records that the Operator is required to retain and the time periods for which they must be retained; and
10. the Emergency Preparedness; and
11. any other requirements determined by the Authority in the implementing regulations.

Article 25

The Regulated Activities are:

1. selection of a site for the Construction of a Nuclear Facility;
2. preparation of a site for the Construction of a Nuclear Facility;
3. Construction of a Nuclear Facility;
4. Commissioning of a Nuclear Facility;
5. Operation of a Nuclear Facility;
6. closure or a change in the Closure date of any Nuclear Facility;
7. Decommissioning of a Nuclear Facility;
8. modifications having significance on Safety to the Management System and organizational arrangements of the structures, systems and equipment of or contained in any Nuclear Facility. The Authority shall determine the nature of the modifications that require its approval;
9. possession, use, manufacture or handling of any Regulated Material or part of any Regulated Material in the State;
10. import or export of any Regulated Material into or from the State, subject to any consents required pursuant to the provisions of Law No 13 of 2007;
11. transportation of any Regulated Material within the State;
12. introduction or removal of any Regulated Material to or from any Nuclear Facility;
13. Storage of any Regulated Material within the State;
14. Disposal of any Regulated Material within the State; and
15. any other activity designated as such from time to time by the implementing and the applicable regulations to this Law by Decree to provide for the effective control of Safety, Nuclear Safety, Nuclear Security, Radiation Protection or any part or stage of any activities referred to above or previously designated as a Regulated Activity by the implementing and the applicable regulations.

The Board, with the guidance of the IAEA measures, shall issue all related regulations and decisions to regulate the procedure of the transport of the Regulated Material and the used means of transport in this regard.

Article (261

1. The Board shall issue the decisions related to the duration and general terms and conditions of any License to operate a nuclear reactor. A License to operate a nuclear reactor may be issued for a period of up to 60 years. The Board shall issue the regulations concerning the duration and general terms and conditions of any License to be issued by the Authority.
2. The Board may, within the limits of the international commitments and agreements, exempt certain Facilities and Activities from the License requirements, provided that such Facilities or Activities do not represent a substantial threat to achieving the priorities and objectives set out in this Law by Decree.

Article 27

1. With exception to acquiring the nationality of the State, the provisions of Federal Law No. (8) of 1984 Regarding Commercial Companies and the amending or replacement laws thereof shall not apply to juridical Licensee licensed pursuant to this Law by Decree to the extent provided in their memoranda and articles of association as approved by the Authority. The competent authorities shall register such juridical Licensee.
2. Foreign companies may set up branches in the State to conduct or assist in the conduct of a Regulated Activity after obtaining the prior approval of the Authority, without the need to appoint a local service agent.

Article 28

1. Prior to the granting of a License, the applicant shall be required to submit detailed evidence of Safety, which shall be reviewed and assessed by the Authority in accordance with defined procedures. The extent of the control applied by the Authority shall be commensurate with the potential magnitude and nature of the hazard as determined by it.
2. The Authority shall issue guidance on the format and content of the documents that should be submitted by the applicant in support of its applications for License. The Operator shall be required to submit or make available to the Authority, in accordance with agreed time-scales, all pertinent information that is specified or requested.
3. Following regulatory review and Assessment the Authority shall:
 - a. Grant a License or a conditional or restrictive License on the Operator's subsequent Activities.
 - b. Refuse a License.

4. The Authority shall formally record the basis for these decisions.
5. An applicant for a License that is refused a License by the Authority or is granted a conditional License may seek a review of that decision by submitting a reasoned request before the Board.
6. Any subsequent amendment, renewal, suspension or revocation of the License shall be undertaken in accordance with the regulations issued by the Authority and a clearly defined and established procedure.

Article 29

The Operator shall comply with the following:

1. to perform a Safety Assessment;
2. to perform a systematic Safety Assessment or a Periodic Safety Review over the lifetime of Nuclear Facilities; and
3. to provide the Authority with any information it deems necessary to perform its duties, including the information related to the Operator's suppliers, even if such information is proprietary.

Article 30

Obtaining a License pursuant to the provisions of this Law by Decree shall not operate to relieve a Person to obtain any other license, permit or authorizations that may be required from any other competent authority for purposes connected with the conduct of its business.

Article 31

The Board may suspend or revoke the License in the following circumstances:

1. in the event of serious violations which, according to the Board's discretion, pose an imminent radiological hazard to workers, public or environment.
2. Operator's continuous non-compliance with the Board's decisions and instructions.
3. release of Radioactive Material to the environment due to malfunctioning at or damage to a Facility.

any other event determined by the Board as hazard to the Nuclear Safety.

Chapter Six

INSPECTION AND CONTROL

Article 32

1. Review and Assessment of the Activity or Facility subject to Review and Assessment shall be performed in every stage of the regulatory process according to the Authority's requirements and the nature and potential magnitude of the hazard.
- 2, The Authority shall define and provide the Operator with the principles and criteria on which its judgments and decisions are based.
3. A primary basis for review and Assessment is the information submitted by the Operator.

A thorough review and Assessment of the Operators technical submission shall be performed by the Authority in order to determine whether the Facility or Activity complies with the relevant Safety objectives, principles and criteria. In doing this, the Authority shall acquire an understanding of the Design of the Facility or equipment, the Safety concepts on which the Design is based and the operating principles proposed by the Operator, to satisfy itself that:

- a. the available information demonstrates the Safety of the Facility or proposed Activity;
 - b, the information contained in the Operator's submissions is accurate and sufficient to enable confirmation of compliance with regulatory requirements;
 - c. the technical solutions, and in particular any novel ones, have been proven or qualified either by competent authorities, experience or testing, and are capable of achieving the required level of Safety;
4. the Authority shall prepare its own program of review and Assessment of the Facilities and Activities under scrutiny which includes development of a Facility or Activity, as applicable, from initial selection of the site, through Design, Construction, Commissioning, and Operation, to Decommissioning or Closure; and
 5. any modification to Safety related aspects of a Facility or Activity shall be subject to review and Assessment, with the potential magnitude and nature of the associated hazard being taken into account.

Article 33

The Board may issue reasoned decisions to exempt any of the practices related to the Radiation Sources from Regulatory Control or any part of it, in accordance with international safety standards and the valuation of the Authority.

Article 34

1. The Operator may, after complying with the License terms and conditions, contract with a contractor for the conduct of all or a material part of the Regulated Activities. In such cases, the Operator shall provide the Authority with the conditions in the contract with regard to the exercise of the Operators responsibilities as defined in this Law by Decree, implementing regulations, applicable regulations and the terms of the Operators License(s).
2. The Operator remains responsible before the Authority according to this Law by Decree, applicable regulations and the terms of its License even if certain activities are conducted by contractors.

Article 35

1. The Authority shall set up a planned and systematic Inspection program. The extent to which Inspection is performed will depend on the potential magnitude and nature of the hazard associated with the Facility or Activity.
2. Inspection by the Authority, both announced and unannounced, shall be a continuing activity. The Authority may take any actions on the basis of these Inspections.
3. In addition to routine Inspections, the Authority shall carry out Inspections at short notice, determined in the implementing regulations, if an abnormal occurrence warrants immediate investigation. Such Regulatory Inspection shall not diminish the responsibility of the Operator to investigate any such occurrence immediately.

Regulatory inspectors shall be required to prepare reports of their Inspections and findings, which shall be fed back into the regulatory process.

Article 36

1. The Authority shall conduct Regulatory Inspection programs which shall cover all areas of regulatory responsibility in relation to the regulatory Activity to ensure that the Operator is in compliance with this Law by Decree, implementing regulations, applicable regulations and the conditions set out in

the License. In addition, the Authority shall take into account, as necessary, the activities of suppliers of services and products to the Operator.

2. The Authority may take any necessary Enforcement Actions on Operator in the event of its breach or defaulting to remedy the breach and compel it to take necessary actions pursuant to the provisions of this Law by Decree, applicable regulations and the conditions set out in the License.
3. If the Operator fails to remedy the breach related to Safety, Nuclear Safety and Nuclear Security within the period specified by the Authority. The Authority shall remove any breach and the consequences thereon by its own resources or through whomever it deems appropriate in order to limit the consequences of such breach. The Operator shall bear the costs of this procedure and the Authority's estimate of such costs shall be final.
4. In carrying out Inspections, the Authority shall seek to ensure that:
 - a. Facilities, equipment and work performance meet all necessary requirements provided this Law by Decree, implementing regulations and the applicable regulations;
 - b. relevant documents and instructions are valid and are being complied with;
 - c. individuals employed by the Operator (including contractors) possess the necessary competence for the effective performance of their functions;
 - d. deficiencies and deviations are identified and corrected by the Operator or justified without undue delay;
 - e. any lessons learned in the area of Nuclear Safety are identified and applied as appropriate; and
 - f. the Operator is managing Safety in a proper manner.
5. Regulatory Inspections shall not diminish the Operator's prime responsibility for Safety or substitute for the control, supervision and verification activities that the Operator must carry out.

Article 37

The Operator shall comply with the Authority's decisions, shall remedy any breach, perform a thorough investigation in accordance with an agreed time-scale with the Authority and take all necessary measures to prevent recurrence. In all cases, the Operator must remove all unsafe aspects.

3. The Authority shall ensure that the Operator has taken the required remedial actions to remove any breach.

4. If there is evidence of a deterioration in the level of Safety, or in the event of serious violations the Authority shall require the Operator to curtail Activities and to take any further action necessary to restore an adequate level of Safety.
5. The Authority shall determine the extent of the powers and Enforcement Actions which the inspectors are entitled to take immediately during their Inspection.
6. Where inspectors are not entitled to take immediate Enforcement Actions, The Operator must furnish the Authority with requested information immediately if the inspectors judge that the health and safety of workers or the public are at risk, or the environment is endangered.

Chapter Seven

REGULATIONS-GUIDELINES-SAFEGUARDS

Article 38

The Board shall issue the regulations specifying the requirements which all Operators must comply with and follow.

1. The Authority shall prepare explanatory guidelines on how to comply with the regulations.
2. In developing regulations and guidelines, the Authority shall take into consideration comments from stakeholders, information made available by experts and internationally recognized standards and recommendations, such as IAEA Safety Standards.

Article 39

1. There shall be established, by a decision of the Board, a national system of accounting and control of Nuclear Materials that complies with the State's international commitments, including:

- a. ensure the fulfillment of obligations which the State undertook to comply by according to the Treaty on the Non-Proliferation of Nuclear Weapons, the Safeguards Agreement and any other additional protocols at the practices and Facilities under its control and work together with other government bodies to fulfill those obligations.

- b. Carry out Inspection in accordance with the Safeguards Agreement, bilateral and multilateral agreement which the State has ratified.

- c. Construct and manage an accounting and Control system of the Nuclear materials.
 - U. Gather appropriate information, including those attained through inspection of Nuclear Facilities in accordance with the terms set by the State.
2. Persons holding Licenses to possess Nuclear Materials are required to:
- a. keep accounting and operational records of Nuclear Materials and submit to the Authority reports of accounting records at the time and in the form specified by the Authority;
 - b. notify the Authority and the relevant competent authorities, without delay of any loss or misappropriation of Nuclear Materials:
 - c. inform the Authority of any interference with equipment under surveillance by the Authority; any interference with equipment under surveillance by an international organization which has signed an agreement with the State on safeguards for Nuclear Materials subject to which Nuclear Materials are controlled; and any Accident with led to or could have led to violation of the integrity of Nuclear Material, as soon as such a fact has been ascertained; and
 - d. enable access by inspectors delegated by the Authority.
3. The Board shall issue the regulations on the manner of keeping the accounting and operational records, performance of control activities, drafting and submission of reports on accounting records and on the method of notifying the Authority of any Incident relating to Nuclear Materials.

Chapter Eight

RADIOACTIVE WASTE AND DECOMMISSIONING

Article 40

- 1. Persons holding Licenses to possess Regulated Materials are responsible for the safe management and Storage of Radioactive Waste from its generation until its delivery to the entity designated by a decision of the Cabinet for the purposes of Disposal.
- 2. The Licensee shall comply with the duties and responsibilities of the safe conduct of the Radioactive Waste in addition to the commitment of applying the Nuclear Security and Nuclear Safety rules determined by the Authority.

3. The Board shall, by detailed rules, determine the requirements, responsibilities and duties for the safe conduct of Radioactive Waste.

Article 41

1. The Cabinet shall issue policy regarding the long term management and disposal of the Spent Nuclear Fuel, the Radioactive Waste and identify the entity in charge of implementing such policy. Radioactive Waste and Spent Nuclear Fuel shall become property of the State from the time of its delivery to the State or to the entity designated by a decision of the Cabinet.
2. The regulations shall specify the terms and procedure for Radioactive Waste delivery to the entity designated by the Cabinet, including the Radioactive Waste which is not subject to delivery, the time limits for such delivery and the fees to be paid by the Radioactive Waste producers to the State..
3. It shall be prohibited by this Law by Decree to import Radioactive Waste and Spent Nuclear Fuel derived from nuclear energy applications outside the State for the purpose of a long term storage or disposal in the State's lands and sites.

Article 42

1. A juridical Person that is licensed to operate a Nuclear Facility that generates or will generate Radioactive Waste shall pay fees into a trust fund called "Decommissioning Trust Fund", established by a decision of the Cabinet according to the Board's recommendation. The fees shall cover:
 - a. costs for the Construction, Operation and Closure of a Radioactive Waste Management Facility including costs for any research and development activities essential for this purpose;
 - b. costs for Decommissioning of the Nuclear Facility;
 - c. costs for regulatory oversight of the Activities referred to in this Article; and
 - d. costs for the management of the trust fund.
2. The fees that are required to **be** paid by the Licensee shall be determined by the Cabinet according to the Authority's proposal, based on the cost to accomplish the Licensee's part of the total costs for the Activities referred to in clause 1 of this Article and shall be paid by the Licensee over the time its License to operate a Nuclear Facility is valid.

If the Licensee is a company owned or controlled by the State or its political subdivisions, the Licensee may deposit a payment with the trust fund to cover all or part of the Licensee's financial obligations with regard to the Activities referred to in the aforementioned clause. Surplus amounts shall be returned to the Licensee to cover a Licensee's part of the total costs.

3. Implementing regulation promulgated by the Board shall specify the procedures for:
 - a. calculating and collecting the fees to the Decommissioning Trust Fund;
 - b. amount and character of the securities to be deposited with the Decommissioning Trust Fund to cover the Licensee's financial obligations with regard to the Activities referred to in this Article that are not covered by fees already paid;
 - c. management of the assets of the Decommissioning Trust Fund; and

payment from the Decommissioning Trust Fund for the costs referred to in this Article.

Chapter Nine

MANAGEMENT OF SAFETY AND QUALITY ASSURANCE

(Physical Protection- Emergency Planning- Emergency Preparedness and Response)

Article 43

1. Each Licensee shall be responsible for taking all steps necessary to reduce the risk of an Accident to a level that is as low as reasonably achievable.
2. The Licensee shall ensure that there is a Management System in place and adequate financial and human resources to ensure Nuclear Safety. The Licensee shall determine the responsibility and authority of individual bodies within its Management System in order to achieve the requirements of the previous paragraph.
3. Each Licensee shall ensure that human and organizational factors are considered in the performance of Regulated Activities.
4. If requested by the Licensee, the Authority shall give reasonable priority to the resolution of Safety issues arising during the Construction of the Facilities.

The Licensee shall perform comprehensive and systematic Safety Assessments and take steps to address any deficiencies that are identified during Design, Construction and Operation of a Nuclear Facility or any other Facility which is subject to the provisions of this Law by Decree, including provisions for Decommissioning. During Operation, the evaluation is to be performed at intervals and with a scope to be established by the Authority through the implementing regulations.

6. The Licensee shall ensure that Occupational Exposures and Public Exposures to Ionizing Radiation and any releases of Radioactive Material to the environment caused by the conduct of Regulated Activities are kept below the prescribed limits during all operational states and Activities, and shall undertake to achieve Doses as low as reasonably achievable. The Licensee shall keep records of measured and estimated Doses and release data and report them to the Authority as specified in the applicable regulations.
7. The Licensee shall make Safety matters related to its licensed Regulated Activities that is not a subject of State secrecy, official secrecy or commercial secrecy a public information.

B. The Licensee shall issue procedures guide concerning the performance of its Activities, especially for the Operation, Maintenance, surveillance and testing of selected equipment. These procedures shall be in line with the approved limits and conditions for safe Operation, and with the approved Quality Assurance programs. When necessary, the Licensee shall update and amend these procedures. The Licensee shall establish a work program for the performance of Safety-related Activities, which are not covered in the procedures guide.

Article (44)

As part of its Management System for Safety, the Licensee shall set up management Safety system and adopt policies and procedures to define and adhere to appropriate Quality Assurance requirements and to categorize equipment necessary for Nuclear Safety according to regulations issued by the Authority.

Quality Assurance Programme set by the Operator shall be subject to approval and Inspection by the Authority.

The Licensee shall be responsible for defining and adhering to Quality Assurance Criteria, including provision of equipment and services during all stages in the life of a Facility.

Implementing regulations of the Law by Decree shall determine the requirements of Quality Assurance systems and the procedures and scope of their approval, and also the categorization of equipment selected as important to Nuclear Safety.

Article (45)

1. The Physical Protection of Nuclear Material and Facilities shall be ensured according to the requirements of the international treaties and agreements entered into by the State in this regard.
2. The Authority shall regulate the Physical Protection of Nuclear Material in accordance with the previous clause.

Article 46

1. Licensees engaged in a Regulated Activity must prepare a Physical Protection plan and obtain the Authority's approval hereto. Such Physical Protection plan must describe the technical measures, internal rules, and instructions which the Licensee will abide by in order to ensure Physical Protection and the areas in which Nuclear Material is or may be present at any time.
2. The Physical Protection plan must be submitted to the Authority together with the application for a License.
3. The Authority may, from time to time, require changes to be made to the Physical Protection plan of any Licensee.
4. The Authority may impose additional terms and conditions on the Physical Protection plan through regulations and decisions.

Article 47

1. A Facility, as well as the locations where related functions take place, may be determined as vital to Physical Protection by a decision of the Cabinet.
2. competent authorities in the State shall provide necessary security to the areas stated in sub-clause (1) of this Clause.

Article 48

Any individual who, by permission, is present within an area identified in any Physical Protection plan as being an area in which Nuclear Material is or may be present at any time must comply with all Physical Protection requirements

established by the applicable regulation or by the relevant Licensee subject to being excluded temporarily or permanently from such areas in the future in case of breach of this Clause.

Article 49

1. The competent authorities and Licensees shall establish measures for Emergency Preparedness and Emergency Response.
2. Emergency Planning measures shall be established:
 - a. for protection of the population (off-site Emergency Plan), which regulates the Emergency Zones and determines the actions to be taken by the competent authorities to protect the population, property and environment in case of an Accident;
 - b. for each Nuclear Facility and the facility that contains sources of nuclear radiations (on-site Emergency Plan), which determines the actions to be taken by the Licensee for Accident mitigation and remediation of consequences in co-ordination with the off-site Emergency Plan.

Article 50

The preparation, Maintenance and co-ordination of the off-site Emergency Plan shall be organized by the competent authorities and Licensees in order to provide civil protection and protection of the public against disasters, accidents and catastrophes.

Article 51

The preparation and maintenance of the off-site Emergency Plan, the provision of material and technical and human resources for its implementation shall be financed by the State's national budget.

Article 52

1. Prior to the Commissioning of a Nuclear Facility, the Licensee shall submit the on-site Emergency Plan to the Authority and the other competent authorities in the State.

2. The Emergency Plan shall be practically tested prior to Nuclear Facility Commissioning and during the course of Operation, and the separate parts of the Emergency Plan shall be periodically tested and evaluated.
3. The Authority shall approve the on-site Emergency Plan prior to Commissioning.

Article 53

Licensee shall be required to familiarize its employees with the Emergency Plans and to conduct special training of employees designated to perform functions in implementing the Emergency Plans.

Article 54

In case of an Accident, Licensees shall be obligated to:

- a. notify the Authority immediately;
- b. warn the population and municipalities within the Emergency Zones and other competent authorities immediately;
- c. take Emergency Action to mitigate and remedy the consequences of the Accident;
- d. control and regulate the exposure of the individuals engaged in Accident mitigation and elimination;
- e. ensure continuous monitoring of radioactive releases into the environment; and;
- f. perform any other obligations as may be established in the Emergency Plans, this Law by Decree, the implementing regulations and the applicable regulations.

Article 55

The terms and procedures for preparation of Emergency Plans, the responsibilities and duties for implementation, the measures for mitigation and remediation of the consequences, the arrangements for warning of the public and the measures for testing Emergency Preparedness shall be established by the applicable regulations of this Law by Decree.

Article 56

The Authority shall coordinate with the relevant official entities for the purposes of the effective monitoring and surveillance of Radioactive Sources at the State's borders and all other areas subject to the provisions of this Law by Decree.

Chapter Ten

CIVIL LIABILITY- PENALTIES

Article 57

The Operator shall be liable on all matters related to Safety, Nuclear Safety, Nuclear Security and Radiation Protection.

Article 58

The civil liability for nuclear damage shall be determined according to the provisions of the international treaties and agreements entered into by the State and the relevant legislation issued in this regard. The Operator shall be solely responsible for compensating any damages that may occur to individuals or properties as a result of its own negligence in operating the Nuclear Facility or not following the Safety and Nuclear Safety requirements according to the international treaties and agreements and the relevant legislations.

Article 59

Any Person who abandons or otherwise causes Sources of Ionizing Radiation to be in an unacceptable condition shall **be** liable to those costs incurred by the Authority for proper controls or custody and/or disposal in order to assure protection of public health and Safety.

Article 60

There shall be penalized by imprisonment for a period not more than one year and a fine not less than AED 1,000,000 (One Million UAE Dirhams) and not more than AED 10,000,000 (Ten Million UAE Dirhams) or by one of these two penalties everyone who operates a Nuclear Facility without a License from the Authority.

Article 61

There shall be penalized by a fine of 500,000 (Five Hundred Thousand UAE Dirhams) any one who carry out any action related to the sources of Nuclear Radiation without a License from the Authority.

Article 62

There shall be penalized by imprisonment for a period of not more than one year and a fine not less than AED 500,000 (Five Hundred Thousand UAE Dirhams) and not more than AED 50,000,000 (Fifty Million UAE Dirhams) or by one of these two penalties:

1. Any one who conducts any of the Regulated Activities without License to do so or without being exempted from obtaining a License pursuant to the provisions of this Law by Decree:
2. Any one who intentionally fails to comply with this Law by Decree, any regulations or any License condition:
3. Any one who intentionally alters, destroys or otherwise suppresses a document or information required by the Authority pursuant to this Law by Decree:
4. Any one who intentionally submits false information required by the Authority in order to make a determination on the issuing of a License: or
5. Any one, without having the right to do so, publishes, transfers or discloses any information or document regarding a Nuclear Material or Nuclear Facility in a way that affects the Physical Protection of the Nuclear Material.

Article 63

A person shall be punished with a temporary jail sentence and a fine of not less than AED 2,000,000 (Two Million UAE Dirhams) and not more than AED 50,000,000 (Fifty Million UAE Dirhams) or by one of those two penalties for committing any of the following:

1. act, without lawful authority, which constitutes the receipt, possession, use, transfer, alteration, disposal or dispersal of Nuclear Material and which causes or is likely to cause death or serious injury to any Person or substantial damage to property;
2. a theft or robbery of Nuclear Material;
3. embezzlement or the fraudulent obtaining of Nuclear Material;
4. an act constituting a demand for Nuclear Material by threat or use of force or by any other form of intimidation; and

5. a threat to use Nuclear Material to cause death or serious injury to any individual or substantial property damage, or to commit any other offence.
6. any act that breaches the provisions of the International Convention for the Suppression of Acts of Nuclear Terrorism ratified by the Federal Decree No (95) of 2007.

Article 64

1. The imposition of the punishments set out herein shall be without prejudice to any severer penalties set out in any other law.
2. In case of repeated offence, the above punishment terms shall be doubled.

Chapter ELEVEN

CLOSING PROVISIONS

Article 65

The personnel entrusted by the Minister of Justice after consulting with the Chairman, shall have powers of the judicial police to report and prove the breaches that occur in violation of the provisions of this Law by Decree, the regulations, instructions and decisions issued in implementation thereof.

Article 66

1- The functions of the competent department in the Federal Environmental Agency and the radiation protection committee specified in the Federal Law No 1 of 2002 regarding the Regulation and Control of the Use of Radiation Sources and Protection Against Their Hazards shall be transferred to the Authority.

2- The employees working in the competent department mentioned in the previous clause shall be transferred from the Federal Environmental Agency to the Authority, and they shall keep all their rights and earned benefits as continuing their service period with the Authority; and that all instruments, laboratories, tools, materials and other existing items used in the Federal Environmental Agency for supervising, regulating and controlling the use of Radiation Sources and protection against the hazards shall be transferred into the Authority.

Article 67

The Board shall establish, by a decision, a committee to be named "the Radiation Protection Committee in the State", the decision shall specify the authorities and bylaws of such committee.

Article 68

Save for what is stipulated by special provision in this Law by Decree, the employees of the Authority shall be subject to Federal Law No (11) of 2008 regarding Human Resources in the Federal Government until the issuance of the relevant regulations and decisions in this regard.

Article 69

The Board shall issue the implementing regulations, other regulations, decisions and instructions required to implement the provisions of the Law by Decree.

Article 70

Current radioactive material licenses issued by any government departments shall remain valid as per their procedures and conditions for a transition period. Licensees shall adjust their status pursuant to the provisions of this Law by Decree within twelve (12) months from the date of publication of this Law by Decree.

Article 71

Any provision that contravenes this Law by Decree shall hereby be repealed. Federal Law No 1 of 2002 Regarding the Regulation and Control of the Use of Radiation Sources and Protection Against Their Hazards shall hereby be repealed.

Article 72

This Law shall be published in the Official Gazette and shall become effective on the following date of its publication.

Khalifa bin Zayed Al Nahyan
President of the United Arab Emirates
Issued at the Presidential Palace in Abu Dhabi

APPENDIX 7: International Convention for the Suppression of Acts of Nuclear Terrorism Source: United Nations

**INTERNATIONAL CONVENTION FOR
THE SUPPRESSION OF ACTS OF
NUCLEAR TERRORISM**



**UNITED NATIONS
2005**

**International Convention for the Suppression of Acts of
Nuclear Terrorism**

The States Parties to this Convention,

Having in mind the purposes and principles of the Charter of the United Nations concerning the maintenance of international peace and security and the promotion of good-neighbourliness and friendly relations and cooperation among States,

Recalling the Declaration on the Occasion of the Fiftieth Anniversary of the United Nations of 24 October 1995,

Recognizing the right of all States to develop and apply nuclear energy for peaceful purposes and their legitimate interests in the potential benefits to be derived from the peaceful application of nuclear energy,

Bearing in mind the Convention on the Physical Protection of Nuclear Material of 1980,

Deeply concerned about the worldwide escalation of acts of terrorism in all its forms and manifestations,

Recalling the Declaration on Measures to Eliminate International Terrorism annexed to General Assembly resolution 49/60 of 9 December 1994, in which, inter alia, the States Members of the United Nations solemnly reaffirm their unequivocal condemnation of all acts, methods and practices of terrorism as criminal and unjustifiable, wherever and by whomever committed, including those which jeopardize the friendly relations among States and peoples and threaten the territorial integrity and security of States,

Noting that the Declaration also encouraged States to review urgently the scope of the existing international legal provisions on the prevention, repression and elimination of terrorism in all its forms and manifestations, with the aim of ensuring that there is a comprehensive legal framework covering all aspects of the matter,

Recalling General Assembly resolution 51/210 of 17 December 1996 and the Declaration to Supplement the 1994 Declaration on Measures to Eliminate International Terrorism annexed thereto,

Recalling also that, pursuant to General Assembly resolution 51/210, an ad hoc committee was established to elaborate, inter alia, an international convention for the suppression of acts of nuclear terrorism to supplement related existing international instruments,

Noting that acts of nuclear terrorism may result in the gravest consequences and may pose a threat to international peace and security,

Noting also that existing multilateral legal provisions do not adequately address those attacks,

Being convinced of the urgent need to enhance international cooperation between States in devising and adopting effective and

practical measures for the prevention of such acts of terrorism and for the prosecution and punishment of their perpetrators,

Noting that the activities of military forces of States are governed by rules of international law outside of the framework of this Convention and that the exclusion of certain actions from the coverage of this Convention does not condone or make lawful otherwise unlawful acts, or preclude prosecution under other laws,

Have agreed as follows:

Article 1

For the purposes of this Convention:

1. “Radioactive material” means nuclear material and other radioactive substances which contain nuclides which undergo spontaneous disintegration (a process accompanied by emission of one or more types of ionizing radiation, such as alpha-, beta-, neutron particles and gamma rays) and which may, owing to their radiological or fissile properties, cause death, serious bodily injury or substantial damage to property or to the environment.
2. “Nuclear material” means plutonium, except that with isotopic concentration exceeding 80 per cent in plutonium-238; uranium-233; uranium enriched in the isotope 235 or 233; uranium containing the mixture of isotopes as occurring in nature other than in the form of ore or ore residue; or any material containing one or more of the foregoing;

Whereby “uranium enriched in the isotope 235 or 233” means uranium containing the isotope 235 or 233 or both in an amount such that the abundance ratio of the sum of these isotopes to the isotope 238 is greater than the ratio of the isotope 235 to the isotope 238 occurring in nature.

3. “Nuclear facility” means:

(a) Any nuclear reactor, including reactors installed on vessels, vehicles, aircraft or space objects for use as an energy source in order to propel such vessels, vehicles, aircraft or space objects or for any other purpose;

(b) Any plant or conveyance being used for the production, storage, processing or transport of radioactive material.

4. “Device” means:

(a) Any nuclear explosive device; or

(b) Any radioactive material dispersal or radiation-emitting device which may, owing to its radiological properties, cause death, serious bodily injury or

5. “State or government facility” includes any permanent or temporary facility or conveyance that is used or occupied by representatives of a State, members of a Government, the legislature or the judiciary or by officials or employees of a State or any other public authority or entity or by employees or officials of an intergovernmental organization in connection with their official duties.

6. “Military forces of a State” means the armed forces of a State which are organized, trained and equipped under its internal law for the primary purpose of national defence or security and persons acting in support of those armed forces who are under their formal command, control and responsibility.

Article 2

1. Any person commits an offence within the meaning of this Convention if that person unlawfully and intentionally:

(a) Possesses radioactive material or makes or possesses a device:

(i) With the intent to cause death or serious bodily injury; or

(ii) With the intent to cause substantial damage to property or to the environment;

(b) Uses in any way radioactive material or a device, or uses or damages a nuclear facility in a manner which releases or risks the release of radioactive material:

(i) With the intent to cause death or serious bodily injury; or

(ii) With the intent to cause substantial damage to property or to the environment; or

(iii) With the intent to compel a natural or legal person, an international organization or a State to do or refrain from doing an act.

2. Any person also commits an offence if that person:
 - (a) Threatens, under circumstances which indicate the credibility of the threat, to commit an offence as set forth in paragraph 1 (b) of the present article; or
 - (b) Demands unlawfully and intentionally radioactive material, a device or a nuclear facility by threat, under circumstances which indicate the credibility of the threat, or by use of force.
3. Any person also commits an offence if that person attempts to commit an offence as set forth in paragraph 1 of the present article.
4. Any person also commits an offence if that person:
 - (a) Participates as an accomplice in an offence as set forth in paragraph 1, 2 or 3 of the present article; or
 - (b) Organizes or directs others to commit an offence as set forth in paragraph 1, 2 or 3 of the present article; or
 - (c) In any other way contributes to the commission of one or more offences as set forth in paragraph 1, 2 or 3 of the present article by a group of persons acting with a common purpose; such contribution shall be intentional and either be made with the aim of furthering the general criminal activity or purpose of the group or be made in the knowledge of the intention of the group to commit the offence or offences concerned.

Article 3

This Convention shall not apply where the offence is committed within a single State, the alleged offender and the victims are nationals of that State, the alleged offender is found in the territory of that State and no other State has a basis under article 9, paragraph 1 or 2, to exercise jurisdiction, except that the provisions of articles 7, 12, 14, 15, 16 and 17 shall, as appropriate, apply in those cases.

Article 4

1. Nothing in this Convention shall affect other rights, obligations and responsibilities of States and individuals under international law, in particular the purposes and principles of the Charter of the United Nations and international humanitarian law.
2. The activities of armed forces during an armed conflict, as those terms are understood under international humanitarian law, which are governed by that law are not governed by this Convention, and the

activities undertaken by military forces of a State in the exercise of their official duties, inasmuch as they are governed by other rules of international law, are not governed by this Convention.

3. The provisions of paragraph 2 of the present article shall not be interpreted as condoning or making lawful otherwise unlawful acts, or precluding prosecution under other laws.

4. This Convention does not address, nor can it be interpreted as addressing, in any way, the issue of the legality of the use or threat of use of nuclear weapons by States.

Article 5

Each State Party shall adopt such measures as may be necessary:

(a) To establish as criminal offences under its national law the offences set forth in article 2;

(b) To make those offences punishable by appropriate penalties which take into account the grave nature of these offences.

Article 6

Each State Party shall adopt such measures as may be necessary, including, where appropriate, domestic legislation, to ensure that criminal acts within the scope of this Convention, in particular where they are intended or calculated to provoke a state of terror in the general public or in a group of persons or particular persons, are under no circumstances justifiable by considerations of a political, philosophical, ideological, racial, ethnic, religious or other similar nature and are punished by penalties consistent with their grave nature.

Article 7

1. States Parties shall cooperate by:

(a) Taking all practicable measures, including, if necessary, adapting their national law, to prevent and counter preparations in their respective territories for the commission within or outside their territories of the offences set forth in article 2, including measures to prohibit in their territories illegal activities of persons, groups and

organizations that encourage, instigate, organize, knowingly finance or knowingly provide technical assistance or information or engage in the perpetration of those offences;

(b) Exchanging accurate and verified information in accordance with their national law and in the manner and subject to the conditions specified herein, and coordinating administrative and other measures taken as appropriate to detect, prevent, suppress and investigate the offences set forth in article 2 and also in order to institute criminal proceedings against persons alleged to have committed those crimes. In particular, a State Party shall take appropriate measures in order to inform without delay the other States referred to in article 9 in respect of the commission of the offences set forth in article 2 as well as preparations to commit such offences about which it has learned, and also to inform, where appropriate, international organizations.

2. States Parties shall take appropriate measures consistent with their national law to protect the confidentiality of any information which they receive in confidence by virtue of the provisions of this Convention from another State Party or through participation in an activity carried out for the implementation of this Convention. If States Parties provide information to international organizations in confidence, steps shall be taken to ensure that the confidentiality of such information is protected.

3. States Parties shall not be required by this Convention to provide any information which they are not permitted to communicate pursuant to national law or which would jeopardize the security of the State concerned or the physical protection of nuclear material.

4. States Parties shall inform the Secretary-General of the United Nations of their competent authorities and liaison points responsible for sending and receiving the information referred to in the present article. The Secretary-General of the United Nations shall communicate such information regarding competent authorities and liaison points to all States Parties and the International Atomic Energy Agency. Such authorities and liaison points must be accessible on a continuous basis.

Article 8

For purposes of preventing offences under this Convention, States Parties shall make every effort to adopt appropriate measures to ensure the protection of radioactive material, taking into account relevant recommendations and functions of the International Atomic Energy Agency.

Article 9

1. Each State Party shall take such measures as may be necessary to establish its jurisdiction over the offences set forth in article 2 when:
 - (a) The offence is committed in the territory of that State; or
 - (b) The offence is committed on board a vessel flying the flag of that State or an aircraft which is registered under the laws of that State at the time the offence is committed; or
 - (c) The offence is committed by a national of that State.
2. A State Party may also establish its jurisdiction over any such offence when:
 - (a) The offence is committed against a national of that State; or
 - (b) The offence is committed against a State or government facility of that State abroad, including an embassy or other diplomatic or consular premises of that State; or
 - (c) The offence is committed by a stateless person who has his or her habitual residence in the territory of that State; or
 - (d) The offence is committed in an attempt to compel that State to do or abstain from doing any act; or
 - (e) The offence is committed on board an aircraft which is operated by the Government of that State.
3. Upon ratifying, accepting, approving or acceding to this Convention, each State Party shall notify the Secretary-General of the United Nations of the jurisdiction it has established under its national law in accordance with paragraph 2 of the present article. Should any change take place, the State Party concerned shall immediately notify the Secretary-General.
4. Each State Party shall likewise take such measures as may be necessary to establish its jurisdiction over the offences set forth in article 2 in cases where the alleged offender is present in its territory and it does not extradite that person to any of the States Parties which have established their jurisdiction in accordance with paragraph 1 or 2 of the present article.
5. This Convention does not exclude the exercise of any criminal jurisdiction established by a State Party in accordance with its national law.

Article 10

1. Upon receiving information that an offence set forth in article 2 has been committed or is being committed in the territory of a State

Party or that a person who has committed or who is alleged to have committed such an offence may be present in its territory, the State Party concerned shall take such measures as may be necessary under its national law to investigate the facts contained in the information.

2. Upon being satisfied that the circumstances so warrant, the State Party in whose territory the offender or alleged offender is present shall take the appropriate measures under its national law so as to ensure that person's presence for the purpose of prosecution or extradition.

3. Any person regarding whom the measures referred to in paragraph 2 of the present article are being taken shall be entitled:

(a) To communicate without delay with the nearest appropriate representative of the State of which that person is a national or which is otherwise entitled to protect that person's rights or, if that person is a stateless person, the State in the territory of which that person habitually resides;

(b) To be visited by a representative of that State;

(c) To be informed of that person's rights under subparagraphs (a) and (b).

4. The rights referred to in paragraph 3 of the present article shall be exercised in conformity with the laws and regulations of the State in the territory of which the offender or alleged offender is present, subject to the

provision that the said laws and regulations must enable full effect to be given to the purposes for which the rights accorded under paragraph 3 are intended.

5. The provisions of paragraphs 3 and 4 of the present article shall be without prejudice to the right of any State Party having a claim to jurisdiction in accordance with article 9, paragraph 1 (c) or 2 (c), to invite the International Committee of the Red Cross to communicate with and visit the alleged offender.

6. When a State Party, pursuant to the present article, has taken a person into custody, it shall immediately notify, directly or through the Secretary-General of the United Nations, the States Parties which have established jurisdiction in accordance with article 9, paragraphs 1 and 2, and, if it considers it advisable, any other interested States Parties, of the fact that that person is in custody and of the circumstances which warrant that person's detention. The State which makes the investigation contemplated in paragraph 1 of the present article shall promptly inform the said States Parties of its findings and shall indicate whether it intends to exercise jurisdiction.

Article 11

1. The State Party in the territory of which the alleged offender is present shall, in cases to which article 9 applies, if it does not extradite that person, be obliged, without exception whatsoever and whether or not the offence was committed in its territory, to submit the case without undue delay to its competent authorities for the purpose of prosecution, through proceedings in accordance with the laws of that State. Those authorities shall take their decision in the same manner as in the case of any other offence of a grave nature under the law of that State.

2. Whenever a State Party is permitted under its national law to extradite or otherwise surrender one of its nationals only upon the condition that the person will be returned to that State to serve the sentence imposed as a result of the trial or proceeding for which the extradition or surrender of the person was sought, and this State and the State seeking the extradition of the person agree with this option and other terms they may deem appropriate, such a conditional extradition or surrender shall be sufficient to discharge the obligation set forth in paragraph 1 of the present article.

Article 12

Any person who is taken into custody or regarding whom any other measures are taken or proceedings are carried out pursuant to this Convention shall be guaranteed fair treatment, including enjoyment of all rights and guarantees in conformity with the law of the State in the territory of which that person is present and applicable provisions of international law, including international law of human rights.

Article 13

1. The offences set forth in article 2 shall be deemed to be included as extraditable offences in any extradition treaty existing between any of the States Parties before the entry into force of this Convention. States Parties undertake to include such offences as extraditable offences in every extradition treaty to be subsequently concluded between them.

2. When a State Party which makes extradition conditional on the existence of a treaty receives a request for extradition from another State Party with which it has no extradition treaty, the requested State Party may, at its option, consider this Convention as a legal basis for extradition in respect of the offences set forth in article 2. Extradition

shall be subject to the other conditions provided by the law of the requested State.

3. States Parties which do not make extradition conditional on the existence of a treaty shall recognize the offences set forth in article 2 as extraditable offences between themselves, subject to the conditions provided by the law of the requested State.

4. If necessary, the offences set forth in article 2 shall be treated, for the purposes of extradition between States Parties, as if they had been committed not only in the place in which they occurred but also in the territory of the States that have established jurisdiction in accordance with article 9, paragraphs 1 and 2.

5. The provisions of all extradition treaties and arrangements between States Parties with regard to offences set forth in article 2 shall be deemed to be modified as between States Parties to the extent that they are incompatible with this Convention.

Article 14

1. States Parties shall afford one another the greatest measure of assistance in connection with investigations or criminal or extradition proceedings brought in respect of the offences set forth in article 2, including assistance in obtaining evidence at their disposal necessary for the proceedings.

2. States Parties shall carry out their obligations under paragraph 1 of the present article in conformity with any treaties or other arrangements on mutual legal assistance that may exist between them. In the absence of such treaties or arrangements, States Parties shall afford one another assistance in accordance with their national law

Article 15

None of the offences set forth in article 2 shall be regarded, for the purposes of extradition or mutual legal assistance, as a political offence or as an offence connected with a political offence or as an offence inspired by political motives. Accordingly, a request for extradition or for mutual legal assistance based on such an offence may not be refused on the sole ground that it concerns a political offence or an offence connected with a political offence or an offence inspired by political motives.

Article 16

Nothing in this Convention shall be interpreted as imposing an obligation to extradite or to afford mutual legal assistance if the requested State Party has substantial grounds for believing that the request for extradition for offences set forth in article 2 or for mutual legal assistance with respect to such offences has been made for the purpose of prosecuting or punishing a person on account of that person's race, religion, nationality, ethnic origin or political opinion or that compliance with the request would cause prejudice to that person's position for any of these reasons.

Article 17

1. A person who is being detained or is serving a sentence in the territory of one State Party whose presence in another State Party is requested for purposes of testimony, identification or otherwise providing assistance in obtaining evidence for the investigation or prosecution of offences under this Convention may be transferred if the following conditions are met:

(a) The person freely gives his or her informed consent; and

(b) The competent authorities of both States agree, subject to such conditions as those States may deem appropriate.

2. For the purposes of the present article:

(a) The State to which the person is transferred shall have the authority and obligation to keep the person transferred in custody, unless otherwise requested or authorized by the State from which the person was transferred;

(b) The State to which the person is transferred shall without delay implement its obligation to return the person to the custody of the State from which the person was transferred as agreed beforehand, or as otherwise agreed, by the competent authorities of both States;

(c) The State to which the person is transferred shall not require the State from which the person was transferred to initiate extradition proceedings for the return of the person;

(d) The person transferred shall receive credit for service of the sentence being served in the State from which he or she was transferred for time spent in the custody of the State to which he or she was transferred.

3. Unless the State Party from which a person is to be transferred in accordance with the present article so agrees, that person, whatever his or her nationality, shall not be prosecuted or detained or subjected to any other restriction of his or her personal liberty in the territory of the State to which that person is transferred in respect of acts or

convictions anterior to his or her departure from the territory of the State from which such person was transferred.

Article 18

1. Upon seizing or otherwise taking control of radioactive material, devices or nuclear facilities, following the commission of an offence set forth in article 2, the State Party in possession of such items shall:

(a) Take steps to render harmless the radioactive material, device or nuclear facility;

(b) Ensure that any nuclear material is held in accordance with applicable International Atomic Energy Agency safeguards; and

(c) Have regard to physical protection recommendations and health and safety standards published by the International Atomic Energy Agency.

2. Upon the completion of any proceedings connected with an offence set forth in article 2, or sooner if required by international law, any radioactive material, device or nuclear facility shall be returned, after consultations (in particular, regarding modalities of return and storage) with the States Parties concerned to the State Party to which it belongs, to the State Party of which the natural or legal person owning such radioactive material, device or facility is a national or resident, or to the State Party from whose territory it was stolen or otherwise unlawfully obtained.

3. (a) Where a State Party is prohibited by national or international law from returning or accepting such radioactive material, device or nuclear facility or where the States Parties concerned so agree, subject to paragraph 3 (b) of the present article, the State Party in possession of the radioactive material, devices or nuclear facilities shall continue to take the steps described in paragraph 1 of the present article; such radioactive material, devices or nuclear facilities shall be used only for peaceful purposes;

(b) Where it is not lawful for the State Party in possession of the radioactive material, devices or nuclear facilities to possess them, that State shall ensure that they are placed as soon as possible in the possession of a State for which such possession is lawful and which, where appropriate, has provided assurances consistent with the requirements of paragraph 1 of the present article in consultation with that State, for the purpose of rendering it harmless; such radioactive material, devices or nuclear facilities shall be used only for peaceful purposes.

4. If the radioactive material, devices or nuclear facilities referred to in paragraphs 1 and 2 of the present article do not belong to any of the States Parties or to a national or resident of a State Party or was not

stolen or otherwise unlawfully obtained from the territory of a State Party, or if no State is willing to receive such items pursuant to paragraph 3 of the present article, a separate decision concerning its disposition shall, subject to paragraph 3 (b) of the present article, be taken after consultations between the States concerned and any relevant international organizations.

5. For the purposes of paragraphs 1, 2, 3 and 4 of the present article, the State Party in possession of the radioactive material, device or nuclear facility may request the assistance and cooperation of other States Parties, in particular the States Parties concerned, and any relevant international organizations, in particular the International Atomic Energy Agency. States Parties and the relevant international organizations are encouraged to provide assistance pursuant to this paragraph to the maximum extent possible.

6. The States Parties involved in the disposition or retention of the radioactive material, device or nuclear facility pursuant to the present article shall inform the Director General of the International Atomic Energy Agency of the manner in which such an item was disposed of or retained. The Director General of the International Atomic Energy Agency shall transmit the information to the other States Parties.

7. In the event of any dissemination in connection with an offence set forth in article 2, nothing in the present article shall affect in any way the rules of international law governing liability for nuclear damage, or other rules of international law.

Article 19

The State Party where the alleged offender is prosecuted shall, in accordance with its national law or applicable procedures, communicate the final outcome of the proceedings to the Secretary-General of the United Nations, who shall transmit the information to the other States Parties.

Article 20

States Parties shall conduct consultations with one another directly or through the Secretary-General of the United Nations, with the assistance of international organizations as necessary, to ensure effective implementation of this Co

Article 21

The States Parties shall carry out their obligations under this Convention in a manner consistent with the principles of sovereign

equality and territorial integrity of States and that of non-intervention in the domestic affairs of other States.

Article 22

Nothing in this Convention entitles a State Party to undertake in the territory of another State Party the exercise of jurisdiction and performance of functions which are exclusively reserved for the authorities of that other State Party by its national law.

Article 23

1. Any dispute between two or more States Parties concerning the interpretation or application of this Convention which cannot be settled through negotiation within a reasonable time shall, at the request of one of them, be submitted to arbitration. If, within six months of the date of the request for arbitration, the parties are unable to agree on the organization of the arbitration, any one of those parties may refer the dispute to the International Court of Justice, by application, in conformity with the Statute of the Court.

2. Each State may, at the time of signature, ratification, acceptance or approval of this Convention or accession thereto, declare that it does not consider itself bound by paragraph 1 of the present article. The other States Parties shall not be bound by paragraph 1 with respect to any State Party which has made such a reservation.

3. Any State which has made a reservation in accordance with paragraph 2 of the present article may at any time withdraw that reservation by notification to the Secretary-General of the United Nations.

Article 24

This Convention shall be open for signature by all States from 14 September 2005 until 31 December 2006 at United Nations Headquarters in New York.

This Convention is subject to ratification, acceptance or approval. The instruments of ratification, acceptance or approval shall be deposited with the Secretary-General of the United Nations.

This Convention shall be open to accession by any State. The instruments of accession shall be deposited with the Secretary-General of the United Nations.

Article 25

1. This Convention shall enter into force on the thirtieth day following the date of the deposit of the twenty-second instrument of ratification, acceptance, approval or accession with the Secretary-General of the United Nations.

2. For each State ratifying, accepting, approving or acceding to the Convention after the deposit of the twenty-second instrument of ratification, acceptance, approval or accession, the Convention shall enter into force on the thirtieth day after deposit by such State of its instrument of ratification, acceptance, approval or accession.

Article 26

1. A State Party may propose an amendment to this Convention. The proposed amendment shall be submitted to the depositary, who circulates it immediately to all States Parties.

2. If the majority of the States Parties request the depositary to convene a conference to consider the proposed amendments, the depositary shall invite all States Parties to attend such a conference to begin no sooner than three months after the invitations are issued.

3. The conference shall make every effort to ensure amendments are adopted by consensus. Should this not be possible, amendments shall be adopted by a two-thirds majority of all States Parties. Any amendment adopted at the conference shall be promptly circulated by the depositary to all States Parties.

4. The amendment adopted pursuant to paragraph 3 of the present article shall enter into force for each State Party that deposits its instrument of ratification, acceptance, accession or approval of the amendment on the thirtieth day after the date on which two thirds of the States Parties have deposited their relevant instrument. Thereafter, the amendment shall enter into force for any State Party on the thirtieth day after the date on which that State deposits its relevant instrument.

Article 27

1. Any State Party may denounce this Convention by written notification to the Secretary-General of the United Nations.

2. Denunciation shall take effect one year following the date on which notification is received by the Secretary-General of the United Nations.

Article 28

The original of this Convention, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Secretary-General of the United Nations, who shall send certified copies thereof to all States.

IN WITNESS WHEREOF, the undersigned, being duly authorized thereto by their respective Governments, have signed this Convention, opened for signature at United Nations Headquarters in New York on 14 September 2005.

**APPENDIX 8: 1963 Vienna Convention on Civil Liability for Nuclear
Damage Source: International Atomic Energy Agency (IAEA)**

**VIENNA CONVENTION ON CIVIL LIABILITY
FOR NUCLEAR DAMAGE**

Done on 21 May 1963

THE CONTRACTING PARTIES,

HAVING RECOGNIZED the desirability of establishing some minimum standards to provide financial protection against damage resulting from certain peaceful uses of nuclear energy,
BELIEVING that a convention on civil liability for nuclear damage would also contribute to the development of friendly relations among nations, irrespective of their differing constitutional and social systems,
HAVE DECIDED to conclude a convention for such purposes, and thereto have agreed as follows -

ARTICLE I

1. For the purposes of this Convention -
 - (a) "Person" means any individual, partnership, any private or public body whether corporate or not, any international organization enjoying legal personality under the law of the Installation State, and any State or any of its constituent sub-divisions.
 - (b) "National of a Contracting Party" includes a Contracting Party or any of its constituent sub-divisions, a partnership, or any private or public body whether corporate or not established within the territory of a Contracting Party.
 - (c) "Operator", in relation to a nuclear installation, means the person designated or recognized by the Installation State as the operator of that installation.
 - (d) "Installation State", in relation to a nuclear installation, means the Contracting Party within whose territory that installation is situated or, if it is not situated within the territory of any State, the Contracting Party by which or under the authority of which the nuclear installation is operated.
 - (e) "Law of the competent court" means the law of the court having jurisdiction under this Convention, including any rules of such law relating to conflict of laws.
 - (f) "Nuclear fuel" means any material which is capable of producing energy by a self-sustaining chain process of nuclear fission.
 - (g) "Radioactive products or waste" means any radioactive material produced in, or any material made radioactive by exposure to the radiation incidental to, the production or utilization of nuclear fuel, but does not include radioisotopes which have reached the final stage of fabrication so as to be usable for any scientific, medical, agricultural, commercial or industrial purpose.
 - (h) "Nuclear material" means -
 - (i) nuclear fuel, other than natural uranium and depleted uranium, capable of producing energy by a self-sustaining chain process of nuclear fission

outside a nuclear reactor, either alone or in combination with some other material; and

(ii) radioactive products or waste.

(i) “Nuclear reactor” means any structure containing nuclear fuel in such an arrangement that a self-sustaining chain process of nuclear fission can occur therein without an additional source of neutrons.

(j) “Nuclear installation” means -

(i) any nuclear reactor other than one with which a means of sea or air transport is equipped for use as a source of power, whether for propulsion thereof or for any other purpose;

(ii) any factory using nuclear fuel for the production of nuclear material, or any factory for the processing of nuclear material, including any factory for the re-processing of irradiated nuclear fuel; and

(iii) any facility where nuclear material is stored, other than storage incidental to the carriage of such material;

provided that the Installation State may determine that several nuclear installations of one operator which are located at the same site shall be considered as a single nuclear installation.

(k) “Nuclear damage” means -

(i) loss of life, any personal injury or any loss of, or damage to, property which arises out of or results from the radioactive properties or a combination of radioactive properties with toxic, explosive or other hazardous properties of nuclear fuel or radioactive products or waste in, or of nuclear material coming from, originating in, or sent to, a nuclear installation;

(ii) any other loss or damage so arising or resulting if and to the extent that the law of the competent court so provides; and

(iii) if the law of the Installation State so provides, loss of life, any personal injury or any loss of, or damage to, property which arises out of or results from other ionizing radiation emitted by any other source of radiation inside a nuclear installation.

(l) “Nuclear incident” means any occurrence or series of occurrences having the same origin which causes nuclear damage.

2. An Installation State may, if the small extent of the risks involved so warrants, exclude any small quantities of nuclear material from the application of this Convention, provided that-

(a) maximum limits for the exclusion of such quantities have been established by the Board of Governors of the International Atomic Energy Agency; and

(b) any exclusion by an Installation State is within such established limits.

The maximum limits shall be reviewed periodically by the Board of Governors.

ARTICLE II

1. The operator of a nuclear installation shall be liable for nuclear damage upon proof that such damage has been caused by a nuclear incident -

(a) in his nuclear installation; or

(b) involving nuclear material coming from or originating in his nuclear installation, and occurring -

- (i) before liability with regard to nuclear incidents involving the nuclear material has been assumed, pursuant to the express terms of a contract in writing, by the operator of another nuclear installation;
 - (ii) in the absence of such express terms, before the operator of another nuclear installation has taken charge of the nuclear material; or
 - (iii) where the nuclear material is intended to be used in a nuclear reactor with which a means of transport is equipped for use as a source of power, whether for propulsion thereof or for any other purpose, before the person duly authorized to operate such reactor has taken charge of the nuclear material; but
 - (iv) where the nuclear material has been sent to a person within the territory of a non-Contracting State, before it has been unloaded from the means of transport by which it has arrived in the territory of that non-Contracting State;
- (c) involving nuclear material sent to his nuclear installation, and occurring -
 - (i) after liability with regard to nuclear incidents involving the nuclear material has been assumed by him, pursuant to the express terms of a contract in writing, from the operator of another nuclear installation;
 - (ii) in the absence of such express terms, after he has taken charge of the nuclear material; or
 - (iii) after he has taken charge of the nuclear material from a person operating a nuclear reactor with which a means of transport is equipped for use as a source of power, whether for propulsion thereof or for any other purpose; but
 - (iv) where the nuclear material has, with the written consent of the operator, been sent from a person within the territory of a non-Contracting State, only after it has been loaded on the means of transport by which it is to be carried from the territory of that State;

provided that, if nuclear damage is caused by a nuclear incident occurring in a nuclear installation and involving nuclear material stored therein incidentally to the carriage of such material, the provisions of subparagraph (a) of this paragraph shall not apply where another operator or person is solely liable pursuant to the provisions of sub-paragraph (b) or (c) of this paragraph.

2. The Installation State may provide by legislation that, in accordance with such terms as may be specified therein, a carrier of nuclear material or a person handling radioactive waste may, at his request and with the consent of the operator concerned, be designated or recognized as operator in the place of that operator in respect of such nuclear material or radioactive waste respectively. In this case such carrier or such person shall be considered, for all the purposes of this Convention, as an operator of a nuclear installation situated within the territory of that State.

3. (a) Where nuclear damage engages the liability of more than one operator, the operators involved shall, in
- so far as the damage attributable to each operator is not reasonably separable, be jointly and severally liable.
 - (b) Where a nuclear incident occurs in the course of carriage of nuclear material, either in one and the same means of transport, or, in the case of storage incidental to the carriage, in one and the same nuclear installation, and causes nuclear damage which engages the liability of

- more than one operator, the total liability shall not exceed the highest amount applicable with respect to any one of them pursuant to Article V.
- (c) In neither of the cases referred to in sub-paragraphs (a) and (b) of this paragraph shall the liability of any one operator exceed the amount applicable with respect to him pursuant to Article V.

4. Subject to the provisions of paragraph 3 of this Article, where several nuclear installations of one and the same operator are involved in one nuclear incident, such operator shall be liable in respect of each nuclear installation involved up to the amount applicable with respect to him pursuant to Article V.

5. Except as otherwise provided in this Convention, no person other than the operator shall be liable for nuclear damage. This, however, shall not affect the application of any international convention in the field of transport in force or open for signature, ratification or accession at the date on which this Convention is opened for signature.

6. No person shall be liable for any loss or damage which is not nuclear damage pursuant to sub-paragraph (k) of paragraph 1 of Article I but which could have been included as such pursuant to sub-paragraph (k)(ii) of that paragraph.

7. Direct action shall lie against the person furnishing financial security pursuant to Article VII, if the law of the competent court so provides.

ARTICLE III

The operator liable in accordance with this Convention shall provide the carrier with a certificate issued by or on behalf of the insurer or other financial guarantor furnishing the financial security required pursuant to Article VII. The certificate shall state the name and address of that operator and the amount, type and duration of the security, and these statements may not be disputed by the person by whom or on whose behalf the certificate was issued. The certificate shall also indicate the nuclear material in respect of which the security applies and shall include a statement by the competent public authority of the Installation State that the person named is an operator within the meaning of this Convention.

ARTICLE IV

1. The liability of the operator for nuclear damage under this Convention shall be absolute.

2. If the operator proves that the nuclear damage resulted wholly or partly either from the gross negligence of the person suffering the damage or from an act or omission of such person done with intent to cause damage, the competent court may, if its law so provides, relieve the operator wholly or partly from his obligation to pay compensation in respect of the damage suffered by such person.

3. (a) No liability under this Convention shall attach to an operator for nuclear damage caused by a nuclear incident directly due to an act of armed conflict, hostilities, civil war or insurrection.

- (b) Except in so far as the law of the Installation State may provide to the contrary, the operator shall not be liable for nuclear damage caused by a

nuclear incident directly due to a grave natural disaster of an exceptional character.

4. Whenever both nuclear damage and damage other than nuclear damage have been caused by a nuclear incident or jointly by a nuclear incident and one or more other occurrences, such other damage shall, to the extent that it is not reasonably separable from the nuclear damage, be deemed, for the purposes of this Convention, to be nuclear damage caused by that nuclear incident. Where, however, damage is caused jointly by a nuclear incident covered by this Convention and by an emission of ionizing radiation not covered by it, nothing in this Convention shall limit or otherwise affect the liability, either as regards any person suffering nuclear damage or by way of recourse or contribution, of any person who may be held liable in connection with that emission of ionizing radiation.

5. The operator shall not be liable under this Convention for nuclear damage -

- (a) to the nuclear installation itself or to any property on the site of that installation which is used or to be used in connection with that installation; or
- (b) to the means of transport upon which the nuclear material involved was at the time of the nuclear incident.

6. Any Installation State may provide by legislation that sub-paragraph (b) of paragraph 5 of this Article shall not apply, provided that in no case shall the liability of the operator in respect of nuclear damage, other than nuclear damage to the means of transport, be reduced to less than US \$5 million for any one nuclear incident.

7. Nothing in this Convention shall affect -

- (a) the liability of any individual for nuclear damage for which the operator, by virtue of paragraph 3 or 5 of this Article, is not liable under this Convention and which that individual caused by an act or omission done with intent to cause damage; or
- (b) the liability outside this Convention of the operator for nuclear damage for which, by virtue of sub paragraph (b) of paragraph 5 of this Article, he is not liable under this Convention

ARTICLE V

1. The liability of the operator may be limited by the Installation State to not less than US \$5 million for any one nuclear incident.

2. Any limits of liability which may be established pursuant to this Article shall not include any interest or costs awarded by a court in actions for compensation of nuclear damage.

3. The United States dollar referred to in this Convention is a unit of account equivalent to the value of the United States dollar in terms of gold on 29 April 1963, that is to say US \$35 per one troy ounce of fine gold.

(4) The sum mentioned in paragraph 6 of Article IV and in paragraph 1 of this Article may be converted into national currency in round figures.

ARTICLE VI

1. Rights of compensation under this Convention shall be extinguished if an action is not brought within ten years from the date of the nuclear incident. If, however, under the law of the Installation State the liability of the operator is covered by insurance or other financial security or by State funds for a period longer than ten years, the law of the competent court may provide that rights of compensation against the operator shall only be extinguished after a period which may be longer than ten years, but shall not be longer than the period for which his liability is so covered under the law of the Installation State. Such extension of the extinction period shall in no case affect rights of compensation under this Convention of any person who has brought an action for loss of life or personal injury against the operator before the expiry of the aforesaid period of ten years.

2. Where nuclear damage is caused by a nuclear incident involving nuclear material which at the time of the nuclear incident was stolen, lost, jettisoned or abandoned, the period established pursuant to paragraph 1 of this Article shall be computed from the date of that nuclear incident, but the period shall in no case exceed a period of twenty years from the date of the theft, loss, jettison or abandonment.

3. The law of the competent court may establish a period of extinction or prescription of not less than three years from the date on which the person suffering nuclear damage had knowledge or should have had knowledge of the damage and of the operator liable for the damage, provided that the period established pursuant to paragraphs 1 and 2 of this Article shall not be exceeded.

4. Unless the law of the competent court otherwise provides, any person who claims to have suffered nuclear damage and who has brought an action for compensation within the period applicable pursuant to this Article may amend his claim to take into account any aggravation of the damage, even after the expiry of that period, provided that final judgment has not been entered.

5. Where jurisdiction is to be determined pursuant to sub-paragraph (b) of paragraph 3 of Article XI and a request has been made within the period applicable pursuant to this Article to any one of the Contracting Parties empowered so to determine, but the time remaining after such determination is less than six months, the period within which an action may be brought shall be six months, reckoned from the date of such determination.

ARTICLE VII

1. The operator shall be required to maintain insurance or other financial security covering his liability for nuclear damage in such amount, of such type and in such terms as the Installation State shall specify. The Installation State shall ensure the payment of claims for compensation for nuclear damage which have been established against the operator by providing the necessary funds to the extent that the yield of insurance or other financial security is inadequate to satisfy such claims, but not in excess of the limit, if any, established pursuant to Article V.

2. Nothing in paragraph 1 of this Article shall require a Contracting Party or any of its constituent sub-divisions, such as States or Republics, to maintain insurance or other financial security to cover their liability as operators.
3. The funds provided by insurance, by other financial security or by the Installation State pursuant to paragraph 1 of this Article shall be exclusively available for compensation due under this Convention.
4. No insurer or other financial guarantor shall suspend or cancel the insurance or other financial security provided pursuant to paragraph 1 of this Article without giving notice in writing of at least two months to the competent public authority or, in so far as such insurance or other financial security relates to the carriage of nuclear material, during the period of the carriage in question.

ARTICLE VIII

Subject to the provisions of this Convention, the nature, form and extent of the compensation, as well as the equitable distribution thereof, shall be governed by the law of the competent court.

ARTICLE IX

1. Where provisions of national or public health insurance, social insurance, social security, workmen's compensation or occupational disease compensation systems include compensation for nuclear damage, rights of beneficiaries of such systems to obtain compensation under this Convention and rights of recourse by virtue of such systems against the operator liable shall be determined, subject to the provisions of this Convention, by the law of the Contracting Party in which such systems have been established, or by the regulations of the intergovernmental organization which has established such systems.
2. (a) If a person who is a national of a Contracting Party, other than the operator, has paid compensation for nuclear damage under an international convention or under the law of a non-Contracting State, such person shall, up to the amount which he has paid, acquire by subrogation the rights under this Convention of the person so compensated. No rights shall be so acquired by any person to the extent that the operator has a right of recourse against such person under this Convention.
(b) Nothing in this Convention shall preclude an operator who has paid compensation for nuclear damage out of funds other than those provided pursuant to paragraph 1 of Article VII from recovering from the person providing financial security pursuant to that paragraph or from the Installation State, up to the amount he has paid, the sum which the person so compensated would have obtained under this Convention.

ARTICLE X

The operator shall have a right of recourse only -

- (a) if this is expressly provided for by a contract in writing; or

- (b) if the nuclear incident results from an act or omission done with intent to cause damage, against the individual who has acted or omitted to act with such intent.

ARTICLE XI

1. Except as otherwise provided in this Article, jurisdiction over actions under Article II shall lie only with the courts of the Contracting Party within whose territory the nuclear incident occurred.
2. Where the nuclear incident occurred outside the territory of any Contracting Party, or where the place of the nuclear incident cannot be determined with certainty, jurisdiction over such actions shall lie with the courts of the Installation State of the operator liable.
3. Where under paragraph 1 or 2 of this Article, jurisdiction would lie with the courts of more than one Contracting Party, jurisdiction shall lie -
 - (a) if the nuclear incident occurred partly outside the territory of any Contracting Party, and partly within the territory of a single Contracting Party, with the courts of the latter; and
 - (b) in any other case, with the courts of that Contracting Party which is determined by agreement between the Contracting Parties whose courts would be competent under paragraph 1 or 2 of this Article.

ARTICLE XII

1. A final judgment entered by a court having jurisdiction under Article XI shall be recognized within the territory of any other Contracting Party, except -
 - (a) where the judgment was obtained by fraud;
 - (b) where the party against whom the judgment was pronounced was not given a fair opportunity to present his case; or
 - (c) where the judgment is contrary to the public policy of the Contracting Party within the territory of which recognition is sought, or is not in accord with fundamental standards of justice.
2. A final judgment which is recognized shall, upon being presented for enforcement in accordance with the formalities required by the law of the Contracting Party where enforcement is sought, be enforceable as if it were a judgment of a court of that Contracting Party.
3. The merits of a claim on which the judgment has been given shall not be subject to further proceedings.

ARTICLE XIII

This Convention and the national law applicable thereunder shall be applied without any discrimination based upon nationality, domicile or residence.

ARTICLE XIV

Except in respect of measures of execution, jurisdictional immunities under rules of national or international law shall not be invoked in actions under this Convention before the courts competent pursuant to Article XI.

ARTICLE XV

The Contracting Parties shall take appropriate measures to ensure that compensation for nuclear damage, interest and costs awarded by a court in connection therewith, insurance and reinsurance premiums and funds provided by insurance, reinsurance or other financial security, or funds provided by the Installation State, pursuant to this Convention, shall be freely transferable into the currency of the Contracting Party within whose territory the damage is suffered, and of the Contracting Party within whose territory the claimant is habitually resident, and, as regards insurance or reinsurance premiums and payments, into the currencies specified in the insurance or reinsurance contract.

ARTICLE XVI

No person shall be entitled to recover compensation under this Convention to the extent that he has recovered compensation in respect of the same nuclear damage under another international convention on civil liability in the field of nuclear energy.

ARTICLE XVII

This Convention shall not, as between the parties to them, affect the application of any international agreements or international conventions on civil liability in the field of nuclear energy in force, or open for signature, ratification or accession at the date on which this Convention is opened for signature.

ARTICLE XVIII

This Convention shall not be construed as affecting the rights, if any, of a Contracting Party under the general rules of public international law in respect of nuclear damage.

ARTICLE XIX

1. Any Contracting Party entering into an agreement pursuant to subparagraph (b) of paragraph 3 of Article XI shall furnish without delay to the Director General of the International Atomic Energy Agency for information and dissemination to the other Contracting Parties a copy of such agreement.
2. The Contracting Parties shall furnish to the Director General for information and dissemination to the other Contracting Parties copies of their respective laws and regulations relating to matters covered by this Convention.

ARTICLE XX

Notwithstanding the termination of the application of this Convention to any Contracting Party, either by termination pursuant to Article XXV or by denunciation pursuant to Article XXVI, the provisions of this Convention shall continue to apply to any nuclear damage caused by a nuclear incident occurring before such termination.

ARTICLE XXI

This Convention shall be open for signature by the States represented at the International Conference on Civil Liability for Nuclear Damage held in Vienna from 29 April to 19 May 1963.

ARTICLE XXII

This Convention shall be ratified, and the instruments of ratification shall be deposited with the Director General of the International Atomic Energy Agency.

ARTICLE XXIII

This Convention shall come into force three months after the deposit of the fifth instrument of ratification, and, in respect of each State ratifying it thereafter, three months after the deposit of the instrument of ratification by that State.

ARTICLE XXIV

1. All States Members of the United Nations, or of any of the specialized agencies or of the International Atomic Energy Agency not represented at the International Conference on Civil Liability for Nuclear Damage held in Vienna from 29 April to 19 May 1963, may accede to this Convention.
2. The instruments of accession shall be deposited with the Director General of the International Atomic Energy Agency.
3. This Convention shall come into force in respect of the acceding State three months after the date of deposit of the instrument of accession of that State but not before the date of the entry into force of this Convention pursuant to Article XXIII.

ARTICLE XXV

1. This Convention shall remain in force for a period of ten years from the date of its entry into force. Any Contracting Party may, by giving before the end of that period at least twelve months' notice to that effect to the Director General of the International Atomic Energy Agency, terminate the application of this Convention to itself at the end of that period of ten years.

2. This Convention shall, after that period of ten years, remain in force for a further period of five years for such Contracting Parties as have not terminated its application pursuant to paragraph 1 of this Article, and thereafter for successive periods of five years each for those Contracting Parties which have not terminated its application at the end of one of such periods, by giving, before the end of one of such periods, at least twelve months' notice to that effect to the Director General of the International Atomic Energy Agency.

ARTICLE XXVI

1. A conference shall be convened by the Director General of the International Atomic Energy Agency at any time after the expiry of a period of five years from the date of the entry into force of this Convention in order to consider the revision thereof, if one-third of the Contracting Parties express a desire to that effect.

2. Any Contracting Party may denounce this Convention by notification to the Director General of the International Atomic Energy Agency within a period of twelve months following the first revision conference held pursuant to paragraph 1 of this Article.

3. Denunciation shall take effect one year after the date on which notification to that effect has been received by the Director General of the International Atomic Energy Agency.

ARTICLE XXVII

The Director General of the International Atomic Energy Agency shall notify the States invited to the International Conference on Civil Liability for Nuclear Damage held in Vienna from 29 April to 19 May 1963 and the States which have acceded to this Convention of the following -

- (a) signatures and instruments of ratification and accession received pursuant to Articles XXI, XXII and XXIV;
- (b) the date on which this Convention will come into force pursuant to Article XXIII;
- (c) notifications of termination and denunciation received pursuant to Articles XXV and XXVI;
- (d) requests for the convening of a revision conference pursuant to Article XXVI.

ARTICLE XXVIII

This Convention shall be registered by the Director General of the International Atomic Energy Agency in accordance with Article 102 of the Charter of the United Nations.

ARTICLE XXIX

The original of this Convention, of which the English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Director General of the International Atomic Energy Agency, who shall issue certified copies.

IN WITNESS WHEREOF, the undersigned Plenipotentiaries, duly authorized thereto, have signed this Convention.

DONE in Vienna, this twenty-first day of May, one thousand nine hundred and sixty-three.

APPENDIX 9: The 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy Source: Nuclear Energy Agency

Convention on Third Party Liability in the Field of Nuclear Energy of 29th July 1960, as amended by the Additional Protocol of 28th January 1964 and by the Protocol of 16th November 1982

The GOVERNMENTS of the Federal Republic of Germany, the Republic of Austria, the Kingdom of Belgium, the Kingdom of Denmark, the Kingdom of Spain, the Republic of Finland, the French Republic, the Hellenic Republic, the Italian Republic, the Grand Duchy of Luxembourg, the Kingdom of Norway, the Kingdom of the Netherlands, the Portuguese Republic, the United Kingdom of Great Britain and Northern Ireland, the Kingdom of Sweden, the Swiss Confederation and the Turkish Republic¹ ;

CONSIDERING that the OECD Nuclear Energy Agency, established within the framework of the Organisation for Economic Co-operation and Development (hereinafter referred to as the "Organisation")², is charged with encouraging the elaboration and harmonization of legislation relating to nuclear energy in participating countries, in particular with regard to third party liability and insurance against atomic risks;

DESIROUS of ensuring adequate and equitable compensation for persons who suffer damage caused by nuclear incidents whilst taking the necessary steps to ensure that the development of the production and uses of nuclear energy for peaceful purposes is not thereby hindered;

CONVINCED of the need for unifying the basic rules applying in the various countries to the liability incurred for such damage, whilst leaving these countries free to take, on a national basis, any additional measures which they deem appropriate;

HAVE AGREED as follows:

Article 1

- a. For the purposes of this Convention:
- i. "A nuclear incident" means any occurrence or succession of occurrences having the same origin which causes damage, provided that such occurrence or succession of occurrences, or any of the damage caused, arises out of or results either from the radioactive properties, or a combination of radioactive properties with toxic, explosive, or other hazardous properties of nuclear fuel or radioactive products or waste or with any of them, or from ionizing radiations emitted by any source of radiation inside a nuclear installation.
 - ii. "Nuclear installation" means reactors other than those comprised in any means of transport; factories for the manufacture or processing of nuclear substances; factories for the separation of isotopes of nuclear fuel; factories for the reprocessing of irradiated nuclear fuel; facilities for the storage of nuclear substances other than storage incidental to the carriage of such substances; and such other installations in which there are nuclear fuel or radioactive products or waste as the Steering Committee for Nuclear Energy of the Organisation (hereinafter referred to as the "Steering Committee") shall from time to time determine; any Contracting Party may determine that two or more nuclear installations of one operator which are located on the same site shall, together with any other premises on that site where radioactive material is held, be treated as a single nuclear installation.
 - iii. "Nuclear fuel" means fissionable material in the form of uranium metal, alloy, or chemical compound (including natural uranium), plutonium metal, alloy, or chemical compound, and such other fissionable material as the Steering Committee shall from time to time determine.

- iv. "Radioactive products or waste" means any radioactive material produced in or made radioactive by exposure to the radiation incidental to the process of producing or utilizing nuclear fuel, but does not include (1) nuclear fuel, or (2) radioisotopes outside a nuclear installation which have reached the final stage of fabrication so as to be usable for any industrial, commercial, agricultural, medical, scientific or educational purpose.
 - v. "Nuclear substances" means nuclear fuel (other than natural uranium and other than depleted uranium) and radioactive products or waste.
 - vi. "Operator" in relation to a nuclear installation means the person designated or recognised by the competent public authority as the operator of that installation.
- b. The Steering Committee may, if in its view the small extent of the risks involved so warrants, exclude any nuclear installation, nuclear fuel, or nuclear substances from the application of this Convention.

Article 2

This Convention does not apply to nuclear incidents occurring in the territory of non-Contracting States or to damage suffered in such territory, unless otherwise provided by the legislation of the Contracting Party in whose territory the nuclear installation of the operator liable is situated, and except in regard to rights referred to in Article 6(e).

Article 3

- a. The operator of a nuclear installation shall be liable, in accordance with this Convention, for:
- i. damage to or loss of life of any person; and
 - ii. damage to or loss of any property other than
 - 1. the nuclear installation itself and any other nuclear installation, including a nuclear

installation under construction, on the site where that installation is located; and

2. any property on that same site which is used or to be used in connection with any such installation,

upon proof that such damage or loss (hereinafter referred to as "damage") was caused by a nuclear incident in such installation or involving nuclear substances coming from such installation, except as otherwise provided for in Article 4.

- b. Where the damage or loss is caused jointly by a nuclear incident and by an incident other than a nuclear incident, that part of the damage or loss which is caused by such other incident, shall, to the extent that it is not reasonably separable from the damage or loss caused by the nuclear incident, be considered to be damage caused by the nuclear incident. Where the damage or loss is caused jointly by a nuclear incident and by an emission of ionizing radiation not covered by this Convention, nothing in this Convention shall limit or otherwise affect the liability of any person in connection with that emission of ionizing radiation.

Article 4

In the case of carriage of nuclear substances, including storage incidental thereto, without prejudice to Article 2:

- a. The operator of a nuclear installation shall be liable, in accordance with this Convention, for damage upon proof that it was caused by a nuclear incident outside that installation and involving nuclear substances in the course of carriage therefrom, only if the incident occurs:
 - i. before liability with regard to nuclear incidents involving the nuclear substances has been assumed, pursuant to the express terms of a contract in writing, by the operator of another nuclear installation;
 - ii. in the absence of such express terms, before the operator of another nuclear installation has taken charge of the nuclear substances; or

- iii. where the nuclear substances are intended to be used in a reactor comprised in a means of transport, before the person duly authorized to operate that reactor has taken charge of the nuclear substances; but
 - iv. where the nuclear substances have been sent to a person within the territory of a non-Contracting State, before they have been unloaded from the means of transport by which they have arrived in the territory of that non-Contracting State.
- b. The operator of a nuclear installation shall be liable, in accordance with this Convention, for damage upon proof that it was caused by a nuclear incident outside that installation and involving nuclear substances in the course of carriage thereto, only if the incident occurs:
 - i. after liability with regard to nuclear incidents involving the nuclear substances has been assumed by him, pursuant to the express terms of a contract in writing, from the operator of another nuclear installation;
 - ii. in the absence of such express terms, after he has taken charge of the nuclear substances; or
 - iii. after he has taken charge of the nuclear substances from a person operating a reactor comprised in a means of transport; but
 - iv. where the nuclear substances have, with the written consent of the operator, been sent from a person within the territory of a non-Contracting State, after they have been loaded on the means of transport by which they are to be carried from the territory of that State.
- c. The operator liable in accordance with this Convention shall provide the carrier with a certificate issued by or on behalf of the insurer or other financial guarantor furnishing the security required pursuant to Article 10. However, a Contracting Party may exclude this obligation in relation to carriage which takes place wholly within its own territory. The certificate shall state the name and address of that operator and the amount, type and duration of the security, and these statements may not be disputed by the person by whom or on whose behalf the

certificate was issued. The certificate shall also indicate the nuclear substances and the carriage in respect of which the security applies and shall include a statement by the competent public authority that the person named is an operator within the meaning of this Convention.

- d. A Contracting Party may provide by legislation that, under such terms as may be contained therein and upon fulfilment of the requirements of Article 10(a), a carrier may, at his request and with the consent of an operator of a nuclear installation situated in its territory, by decision of the competent public authority, be liable in accordance with this Convention in place of that operator. In such case for all the purposes of this Convention the carrier shall be considered, in respect of nuclear incidents occurring in the course of carriage of nuclear substances, as an operator of a nuclear installation on the territory of the Contracting Party whose legislation so provides.

Article 5

- a. If the nuclear fuel or radioactive products or waste involved in a nuclear incident have been in more than one nuclear installation and are in a nuclear installation at the time damage is caused, no operator of any nuclear installation in which they have previously been shall be liable for the damage.
- b. Where, however, damage is caused by a nuclear incident occurring in a nuclear installation and involving only nuclear substances stored therein incidentally to their carriage, the operator of the nuclear installation shall not be liable where another operator or person is liable pursuant to Article 4.
- c. If the nuclear fuel or radioactive products or waste involved in a nuclear incident have been in more than one nuclear installation and are not in a nuclear installation at the time damage is caused, no operator other than the operator of the last nuclear installation in which they were before the damage was caused or an operator who has subsequently taken them in charge, or has assumed liability therefor pursuant to the

express terms of a contract in writing shall be liable for the damage.

- d. If damage gives rise to liability of more than one operator in accordance with this Convention, the liability of these operators shall be joint and several: provided that where such liability arises as a result of damage caused by a nuclear incident involving nuclear substances in the course of carriage in one and the same means of transport, or, in the case of storage incidental to the carriage, in one and the same nuclear installation, the maximum total amount for which such operators shall be liable shall be the highest amount established with respect to any of them pursuant to Article 7 and provided that in no case shall any one operator be required, in respect of a nuclear incident, to pay more than the amount established with respect to him pursuant to Article 7.

Article 6

- a. The right to compensation for damage caused by a nuclear incident may be exercised only against an operator liable for the damage in accordance with this Convention, or, if a direct right of action against the insurer or other financial guarantor furnishing the security required pursuant to Article 10 is given by national law, against the insurer or other financial guarantor.
- b. Except as otherwise provided in this Article, no other person shall be liable for damage caused by a nuclear incident, but this provision shall not affect the application of any international agreement in the field of transport in force or open for signature, ratification or accession at the date of this Convention.
- c.
 - i. Nothing in this Convention shall affect the liability:
 - 1. of any individual for damage caused by a nuclear incident for which the operator, by virtue of Article 3(a)(ii)(1) and (2) or Article 9, is not liable under this Convention and which results

from an act or omission of that individual done with intent to cause damage;

2. of a person duly authorized to operate a reactor comprised in a means of transport for damage caused by a nuclear incident when an operator is not liable for such damage pursuant to Article 4(a)(iii) or (b)(iii).

- ii. The operator shall incur no liability outside this Convention for damage caused by a nuclear incident.

- d. Any person who has paid compensation in respect of damage caused by a nuclear incident under any international agreement referred to in paragraph (b) of this Article or under any legislation of a non-Contracting State shall, up to the amount which he has paid, acquire by subrogation the rights under this Convention of the person suffering damage whom he has so compensated.
- e. Any person who has his principal place of business in the territory of a Contracting Party or who is the servant of such a person and who has paid compensation in respect of damage caused by a nuclear incident occurring in the territory of a non-Contracting State or in respect of damage suffered in such territory shall, up to the amount which he has paid, acquire the rights which the person so compensated would have had against the operator but for the provisions of Article 2.
- f. The operator shall have a right of recourse only:
 - i. if the damage caused by a nuclear incident results from an act or omission done with intent to cause damage, against the individual acting or omitting to act with such intent;
 - ii. if and to the extent that it is so provided expressly by contract.
- g. If the operator has a right of recourse to any extent pursuant to paragraph (f) of this Article against any person, that person shall not, to that extent, have a right against the operator under paragraphs (d) or (e) of this Article.
- h. Where provisions of national or public health insurance, social security, workmen's compensation or occupational disease

compensation systems include compensation for damage caused by a nuclear incident, rights of beneficiaries of such systems and rights of recourse by virtue of such systems shall be determined by the law of the Contracting Party or by the regulations of the inter-Governmental organisation which has established such systems.

Article 7

- a. The aggregate of compensation required to be paid in respect of damage caused by a nuclear incident shall not exceed the maximum liability established in accordance with this Article.
- b. The maximum liability of the operator in respect of damage caused by a nuclear incident shall be 15 000 000 Special Drawing Rights as defined by the International Monetary Fund and used by it for its own operations and transactions (hereinafter referred to as "Special Drawing Rights"). However,
 - i. any Contracting Party, taking into account the possibilities for the operator of obtaining the insurance or other financial security required pursuant to Article 10, may establish by legislation a greater or lesser amount;
 - ii. any Contracting Party, having regard to the nature of the nuclear installation or the nuclear substances involved and to the likely consequences of an incident originating therefrom, may establish a lower amount, provided that in no event shall any amounts so established be less than 5 000 000 Special Drawing Rights. The sums mentioned above may be converted into national currency in round figures.
- c. Compensation for damage caused to the means of transport on which the nuclear substances involved were at the time of the nuclear incident shall not have the effect of reducing the liability of the operator in respect of other damage to an amount less than either 5 000 000 Special Drawing Rights, or any higher amount established by the legislation of a Contracting Party.

- d. The amount of liability of operators of nuclear installations in the territory of a Contracting Party established in accordance with paragraph (b) of this Article as well as the provisions of any legislation of a Contracting Party pursuant to paragraph (c) of this Article shall apply to the liability of such operators wherever the nuclear incident occurs.
- e. A Contracting Party may subject the transit of nuclear substances through its territory to the condition that the maximum amount of liability of the foreign operator concerned be increased, if it considers that such amount does not adequately cover the risks of a nuclear incident in the course of the transit: provided that the maximum amount thus increased shall not exceed the maximum amount of liability of operators of nuclear installations situated in its territory.
- f. The provisions of paragraph (e) of this Article shall not apply:
 - i. to carriage by sea where, under international law, there is a right of entry in cases of urgent distress into the ports of such Contracting Party or a right of innocent passage through its territory; or
 - ii. to carriage by air where, by agreement or under international law there is a right to fly over or land on the territory of such Contracting Party.
- g. Any interest and costs awarded by a court in actions for compensation under this Convention shall not be considered to be compensation for the purposes of this Convention and shall be payable by the operator in addition to any sum for which he is liable in accordance with this Article.

Article 8

- a. The right of compensation under this Convention shall be extinguished if an action is not brought within ten years from the date of the nuclear incident. National legislation may, however, establish a period longer than ten years if measures have been taken by the Contracting Party in whose territory the nuclear installation of the operator liable is situated to cover the liability of that operator in respect of any actions for compensation begun after the expiry of the period of ten years

and during such longer period: provided that such extension of the extinction period shall in no case affect the right of compensation under this Convention of any person who has brought an action in respect of loss of life or personal injury against the operator before the expiry of the period of ten years.

- b. In the case of damage caused by a nuclear incident involving nuclear fuel or radioactive products or waste which, at the time of the incident have been stolen, lost, jettisoned or abandoned and have not yet been recovered, the period established pursuant to paragraph (a) of this Article shall be computed from the date of that nuclear incident, but the period shall in no case exceed twenty years from the date of the theft, loss, jettison or abandonment.
- c. National legislation may establish a period of not less than two years for the extinction of the right or as a period of limitation either from the date at which the person suffering damage has knowledge or from the date at which he ought reasonably to have known of both the damage and the operator liable: provided that the period established pursuant to paragraphs (a) and (b) of this Article shall not be exceeded.
- d. Where the provisions of Article 13(c)(ii) are applicable, the right of compensation shall not, however, be extinguished if, within the time provided for in paragraphs (a), (b) and (c) of this Article,
 - i. prior to the determination by the Tribunal referred to in Article 17, an action has been brought before any of the courts from which the Tribunal can choose; if the Tribunal determines that the competent court is a court other than that before which such action has already been brought, it may fix a date by which such action has to be brought before the competent court so determined; or
 - ii. a request has been made to a Contracting Party concerned to initiate a determination by the Tribunal of the competent court pursuant to Article 13(c)(ii) and an

action is brought subsequent to such determination within such time as may be fixed by the Tribunal.

- e. Unless national law provides to the contrary, any person suffering damage caused by a nuclear incident who has brought an action for compensation within the period provided for in this Article may amend his claim in respect of any aggravation of the damage after the expiry of such period provided that final judgment has not been entered by the competent court.

Article 9

The operator shall not be liable for damage caused by a nuclear incident directly due to an act of armed conflict, hostilities, civil war, insurrection or, except in so far as the legislation of the Contracting Party in whose territory his nuclear installation is situated may provide to the contrary, a grave natural disaster of an exceptional character.

Article 10

- a. To cover the liability under this Convention, the operator shall be required to have and maintain insurance or other financial security of the amount established pursuant to Article 7 and of such type and terms as the competent public authority shall specify.
- b. No insurer or other financial guarantor shall suspend or cancel the insurance or other financial security provided for in paragraph (a) of this Article without giving notice in writing of at least two months to the competent public authority or in so far as such insurance or other financial security relates to the carriage of nuclear substances, during the period of the carriage in question.
- c. The sums provided as insurance, reinsurance, or other financial security may be drawn upon only for compensation for damage caused by a nuclear incident.

Article 11

The nature, form and extent of the compensation, within the limits of this Convention, as well as the equitable distribution thereof, shall be governed by national law.

Article 12

Compensation payable under this Convention, insurance and reinsurance premiums, sums provided as insurance, reinsurance, or other financial security required pursuant to Article 10, and interest and costs referred to in Article 7(g), shall be freely transferable between the monetary areas of the Contracting Parties.

Article 13

- a. Except as otherwise provided in this Article, jurisdiction over actions under Articles 3, 4, 6(a) and 6(e) shall lie only with the courts of the Contracting Party in whose territory the nuclear incident occurred.
- b. Where a nuclear incident occurs outside the territory of the Contracting Parties, or where the place of the nuclear incident cannot be determined with certainty, jurisdiction over such actions shall lie with the courts of the Contracting Party in whose territory the nuclear installation of the operator liable is situated.
- c. Where jurisdiction would lie with the courts of more than one Contracting Party by virtue of paragraphs (a) or (b) of this Article, jurisdiction shall lie,
 - i. if the nuclear incident occurred partly outside the territory of any Contracting Party and partly in the territory of a single Contracting Party, with the courts of that Contracting Party; and
 - ii. in any other case, with the courts of the Contracting Party determined, at the request of a Contracting Party

concerned, by the Tribunal referred to in Article 17 as being the most closely related to the case in question.

- d. Judgments entered by the competent court under this Article after trial, or by default, shall, when they have become enforceable under the law applied by that court, become enforceable in the territory of any of the other Contracting Parties as soon as the formalities required by the Contracting Party concerned have been complied with. The merits of the case shall not be the subject of further proceedings. The foregoing provisions shall not apply to interim judgments.
- e. If an action is brought against a Contracting Party under this Convention, such Contracting Party may not, except in respect of measures of execution, invoke any jurisdictional immunities before the court competent in accordance with this Article.

Article 14

- a. This Convention shall be applied without any discrimination based upon nationality, domicile, or residence.
- b. "National law" and "national legislation" mean the national law or the national legislation of the court having jurisdiction under this Convention over claims arising out of a nuclear incident, and that law or legislation shall apply to all matters both substantive and procedural not specifically governed by this Convention.
- c. That law and legislation shall be applied without any discrimination based upon nationality, domicile, or residence.

Article 15

- a. Any Contracting Party may take such measures as it deems necessary to provide for an increase in the amount of compensation specified in this Convention.
- b. In so far as compensation for damage involves public funds and is in excess of the 5 000 000 Special Drawing Rights referred to in Article 7, any such measure in whatever form

may be applied under conditions which may derogate from the provisions of this Convention.

Article 16

Decisions taken by the Steering Committee under Article 1(a)(ii), 1(a)(iii) and 1(b) shall be adopted by mutual agreement of the members representing the Contracting Parties.

Article 17

Any dispute arising between two or more Contracting Parties concerning the interpretation or application of this Convention shall be examined by the Steering Committee and in the absence of friendly settlement shall, upon the request of a Contracting Party concerned, be submitted to the Tribunal established by the Convention of 20th December 1957 on the Establishment of a Security Control in the Field of Nuclear Energy.

Article 18

- a. Reservations to one or more of the provisions of this Convention may be made at any time prior to ratification of or accession to this Convention or prior to the time of notification under Article 23 in respect of any territory or territories mentioned in the notification, and shall be admissible only if the terms of these reservations have been expressly accepted by the Signatories.
- b. Such acceptance shall not be required from a Signatory which has not itself ratified this Convention within a period of twelve months after the date of notification to it of such reservation by the Secretary-General of the Organisation in accordance with Article 24.

- c. Any reservation admitted in accordance with this Article may be withdrawn at any time by notification addressed to the Secretary-General of the Organisation.

Article 19

- a. This Convention shall be ratified. Instruments of ratification shall be deposited with the Secretary-General of the Organisation.
- b. This Convention shall come into force upon the deposit of instruments of ratification by not less than five of the Signatories. For each Signatory ratifying thereafter, this Convention shall come into force upon the deposit of its instrument of ratification.

Article 20

Amendments to this Convention shall be adopted by mutual agreement of all the Contracting Parties. They shall come into force when ratified or confirmed by two-thirds of the Contracting Parties. For each Contracting Party ratifying or confirming thereafter, they shall come into force at the date of such ratification or confirmation.

Article 21

- a. The Government of any Member or Associate country of the Organisation which is not a Signatory to this Convention may accede thereto by notification addressed to the Secretary-General of the Organisation.
- b. The Government of any other country which is not a Signatory to this Convention may accede thereto by notification addressed to the Secretary-General of the Organisation and with the unanimous assent of the Contracting Parties. Such accession shall take effect from the date of such assent.

Article 22

- a. This Convention shall remain in effect for a period of ten years as from the date of its coming into force. Any Contracting Party may, by giving twelve months' notice to the Secretary-General of the Organisation, terminate the application of this Convention to itself at the end of the period of ten years.
- b. This Convention shall, after the period of ten years, remain in force for a period of five years for such Contracting Parties as have not terminated its application in accordance with paragraph (a) of this Article, and thereafter for successive periods of five years for such Contracting Parties as have not terminated its application at the end of one of such periods of five years by giving twelve months' notice to that effect to the Secretary-General of the Organisation.
- c. A conference shall be convened by the Secretary-General of the Organisation in order to consider revisions to this Convention after a period of five years as from the date of its coming into force or, at any other time, at the request of a Contracting Party, within six months from the date of such request.

Article 23

- a. This Convention shall apply to the metropolitan territories of the Contracting Parties.
- b. Any Signatory or Contracting Party may, at the time of signature or ratification of or accession to this Convention or at any later time, notify the Secretary-General of the Organisation that this Convention shall apply to those of its territories, including the territories for whose international relations it is responsible, to which this Convention is not applicable in accordance with paragraph (a) of this Article and which are mentioned in the notification. Any such notification may in respect of any territory or territories mentioned therein be withdrawn by giving twelve months' notice to that effect to the Secretary-General of the Organisation.

- c. Any territories of a Contracting Party, including the territories for whose international relations it is responsible, to which this Convention does not apply shall be regarded for the purposes of this Convention as being a territory of a non-Contracting State.

Article 24

The Secretary-General of the Organisation shall give notice to all Signatories and acceding Governments of the receipt of any instrument of ratification, accession, withdrawal, notification under Article 23, and decisions of the Steering Committee under Article 1(a)(ii), 1(a)(iii) and 1(b). He shall also notify them of the date on which this Convention comes into force, the text of any amendment thereto and of the date on which such amendment comes into force, and any reservation made in accordance with Article 18.

Annex I

The following reservations were accepted either at the time of signature of the Convention or at the time of signature of the Additional Protocol:

- 1.6(a) and (c)(i):
Reservation by the Government of the Federal Republic of Germany, the Government of the Republic of Austria and the Government of the Hellenic Republic.
Reservation of the right to provide, by national law, that persons other than the operator may continue to be liable for damage caused by a nuclear incident on condition that these persons are fully covered in respect of their liability, including defence against unjustified actions, by insurance or other financial security obtained by the operator or out of State funds.
- 2.6(b) and (d):

Reservation by the Government of the Republic of Austria, the Government of the Hellenic Republic, the Government of the Kingdom of Norway and the Government of the Kingdom of Sweden ³.

Reservation of the right to consider their national legislation which includes provisions equivalent to those included in the international agreements referred to in Article 6(b) as being international agreements within the meaning of Article 6(b) and (d).

- 3.8(a):

Reservation by the Government of the Federal Republic of Germany and the Government of the Republic of Austria.

Reservation of the right to establish, in respect of nuclear incidents occurring in the Federal Republic of Germany and in the Republic of Austria respectively, a period longer than ten years if measures have been taken to cover the liability of the operator in respect of any actions for compensation begun after the expiry of the period of ten years and during such longer period.

- 4.9:

Reservation by the Government of the Federal Republic of Germany and the Government of the Republic of Austria.

Reservation of the right to provide, in respect of nuclear incidents occurring in the Federal Republic of Germany and in the Republic of Austria respectively, that the operator shall be liable for damage caused by a nuclear incident directly due to an act of armed conflict, hostilities, civil war, insurrection or a grave natural disaster of an exceptional character.

- 5.19 :

Reservation by the Government of the Federal Republic of Germany, the Government of the Republic of Austria, and the Government of the Hellenic Republic.

Reservation of the right to consider ratification of this Convention as constituting an obligation under international law to enact national legislation on third party liability in the field of nuclear energy in accordance with the provisions of this Convention.

Annex II

This Convention shall not be interpreted as depriving a Contracting Party, on whose territory damage was caused by a nuclear incident occurring on the territory of another Contracting Party, of any recourse which might be available to it under international law.

IN WITNESS WHEREOF, the undersigned Plenipotentiaries, duly empowered, have signed this Convention.

DONE in Paris, this twenty-ninth day of July Nineteen Hundred and Sixty, in the English, French, German, Spanish, Italian and Dutch languages in a single copy which shall remain deposited with the Secretary-General of the Organisation for European Economic Co-operation² by whom certified copies will be communicated to all Signatories.

Notes by the Secretariat

1. The designation of the Signatories is the same as that in the Protocol of 16th November 1982. It should be noted that Finland acceded to the Paris Convention and the Additional Protocol of 1964 on 16th June 1972 and has signed the Protocol of 1982.
2. The Organisation for European Economic Co-operation (OEEC) was reconstituted as the Organisation for Economic Co-operation and Development (OECD) on 30th September 1961, in accordance with the provisions of the Convention on the Organisation for Economic Co-operation and Development of 14th December 1960.

In addition, following the Decision of the OECD Council dated 17th May 1972 [C(72)106 (Final)], the European Nuclear Energy Agency (ENEA) is now called the OECD Nuclear Energy Agency (NEA).

3. At the time of the deposit of its instruments of accession, the Government of Finland subordinated its accession to the present reservation.

APPENDIX 10: IAEA 1997 Protocol to Amend the Vienna Convention on Civil Liability.

Source: International Atomic Energy Agency (IAEA)

**PROTOCOL TO AMEND THE VIENNA
CONVENTION ON
CIVIL LIABILITY FOR NUCLEAR DAMAGE**

Done on 12 September 1997

THE STATES PARTIES TO THIS PROTOCOL,

CONSIDERING that it is desirable to amend the Vienna Convention on Civil Liability for Nuclear Damage of 21 May 1963, to provide for broader scope, increased amount of liability of the operator of a nuclear installation and enhanced means for securing adequate and equitable compensation,

HAVE AGREED as follows,

ARTICLE 1

The Convention which the provisions of this Protocol amend is the Vienna Convention on Civil Liability for Nuclear Damage of 21 May 1963, hereinafter referred to as the “1963 Vienna Convention”.

ARTICLE 2

Article I of the 1963 Vienna Convention is amended as follows:

1. Paragraph 1(j) is amended as follows:

(a) the word “and” is deleted at the end of sub-paragraph (ii) and is inserted at the end of sub-paragraph (iii).

(b) a new sub-paragraph (iv) is added as follows:

(iv) such other installations in which there are nuclear fuel or radioactive products or waste as the Board of Governors of the International Atomic Energy Agency shall from time to time determine;

2. Paragraph 1(k) is replaced by the following text:

(k) “Nuclear Damage” means -

- (i) loss of life or personal injury;
- (ii) loss of or damage to property;

and each of the following to the extent determined by the law of the competent court -

- (iii) economic loss arising from loss or damage referred to in sub-paragraph (i) or (ii), insofar as not included in those sub-paragraphs, if incurred by a person entitled to claim in respect of such loss or damage;
- (iv) the costs of measures of reinstatement of impaired environment, unless such impairment is insignificant, if such measures are actually taken or to be taken, and insofar as not included in sub-paragraph (ii);
- (v) loss of income deriving from an economic interest in any use or enjoyment of the environment, incurred as a result of a significant impairment of that environment, and insofar as not included in sub-paragraph (ii);
- (vi) the costs of preventive measures, and further loss or damage caused by such measures;
- (vii) any other economic loss, other than any caused by the impairment of the environment, if permitted by the general law on civil liability of the competent court,

in the case of subparagraphs (i) to (v) and (vii) above, to the extent that the loss or damage arises out of or results from ionizing radiation emitted by any source of radiation inside a nuclear installation, or emitted from nuclear fuel or radioactive products or waste in, or of nuclear material coming from, originating in, or sent to, a nuclear installation, whether so arising from the radioactive properties of such matter, or from a combination of radioactive properties with toxic, explosive or other hazardous properties of such matter.

3. Paragraph 1(l) is replaced by the following text:

- (l) “Nuclear incident” means any occurrence or series of occurrences having the same origin which causes nuclear damage or, but only with respect to preventive measures, creates a grave and imminent threat of causing such damage.

4. After paragraph 1(l) four new paragraphs 1(m), 1(n), 1(o) and 1(p) are added as follows:

- (m) “Measures of reinstatement” means any reasonable measures which have been approved by the competent authorities of the State where the measures were taken, and which aim to reinstate or restore damaged or destroyed components of the environment, or to introduce, where reasonable, the equivalent of these components into the environment. The law of the State where the damage is suffered shall determine who is entitled to take such measures.
- (n) “Preventive measures” means any reasonable measures taken by any person after a nuclear incident has occurred to prevent or minimize damage referred to in sub-paragraphs (k)(i) to (v) or (vii), subject to any approval of the competent authorities required by the law of the State where the measures were taken.
- (o) “Reasonable measures” means measures which are found under the law of the competent court to be appropriate and proportionate having regard to all the circumstances, for example -
 - (i) the nature and extent of the damage incurred or, in the case of preventive measures, the nature and extent of the risk of such damage;
 - (ii) the extent to which, at the time they are taken, such measures are likely to be effective; and

- (iii) relevant scientific and technical expertise.
- (p) “Special Drawing Right”, hereinafter referred to as SDR, means the unit of account defined by the International Monetary Fund and used by it for its own operations and transactions.

5. Paragraph 2 is replaced by the following text:

2. An Installation State may, if the small extent of the risks involved so warrants, exclude any nuclear installation or small quantities of nuclear material from the application of this Convention, provided that -

- (a) with respect to nuclear installations, criteria for such exclusion have been established by the Board of Governors of the International Atomic Energy Agency and any exclusion by an Installation State satisfies such criteria; and
- (b) with respect to small quantities of nuclear material, maximum limits for the exclusion of such quantities have been established by the Board of Governors of the International Atomic Energy Agency and any exclusion by an Installation State is within such established limits.

The criteria for the exclusion of nuclear installations and the maximum limits for the exclusion of small quantities of nuclear material shall be reviewed periodically by the Board of Governors.

ARTICLE 3

After Article I of the 1963 Vienna Convention two new Articles I A and I B are added as follows:

ARTICLE I A

1. This Convention shall apply to nuclear damage wherever suffered.
2. However, the legislation of the Installation State may exclude from the application of this Convention damage suffered -
 - (a) in the territory of a non-Contracting State; or
 - (b) in any maritime zones established by a non-Contracting State in accordance with the international law of the sea.
3. An exclusion pursuant to paragraph 2 of this Article may apply only in respect of a non-Contracting State which at the time of the incident -
 - (a) has a nuclear installation in its territory or in any maritime zones established by it in accordance with the international law of the sea; and
 - (b) does not afford equivalent reciprocal benefits.

4. Any exclusion pursuant to paragraph 2 of this Article shall not affect the rights referred to in sub-paragraph (a) of paragraph 2 of Article IX and any exclusion pursuant to paragraph 2(b) of this Article shall not extend to damage on board or to a ship or an aircraft.

ARTICLE I B

This Convention shall not apply to nuclear installations used for non-peaceful purposes.

ARTICLE 4

Article II of the 1963 Vienna Convention is amended as follows:

1. At the end of paragraph 3(a) the following text is added:

The Installation State may limit the amount of public funds made available per incident to the difference, if any, between the amounts hereby established and the amount established pursuant to paragraph 1 of Article V.
2. At the end of paragraph 4 the following text is added:

The Installation State may limit the amount of public funds made available as provided for in sub-paragraph (a) of paragraph 3 of this Article.
3. Paragraph 6 is replaced by the following text:
6. No person shall be liable for any loss or damage which is not nuclear damage pursuant to sub-paragraph (k) of paragraph 1 of Article I but which could have been determined as such pursuant to the provisions of that sub-paragraph.

ARTICLE 5

After the first sentence in Article III of the 1963 Vienna Convention the following text is added:

However, the Installation State may exclude this obligation in relation to carriage which takes place wholly within its own territory.

ARTICLE 6

Article IV of the 1963 Vienna Convention is amended as follows:

1. Paragraph 3 is replaced by the following text:

3. No liability under this Convention shall attach to an operator if he proves that the nuclear damage is directly due to an act of armed conflict, hostilities, civil war or insurrection.
2. Paragraph 5 is replaced by the following text:

5. The operator shall not be liable under this Convention for nuclear damage -
- (a) to the nuclear installation itself and any other nuclear installation, including a nuclear installation under construction, on the site where that installation is located; and
 - (b) to any property on that same site which is used or to be used in connection with any such installation.
3. Paragraph 6 is replaced by the following text:
6. Compensation for damage caused to the means of transport upon which the nuclear material involved was at the time of the nuclear incident shall not have the effect of reducing the liability of the operator in respect of other damage to an amount less than either 150 million SDRs, or any higher amount established by the legislation of a Contracting Party, or an amount established pursuant to sub-paragraph (c) of paragraph 1 of Article V.
4. Paragraph 7 is replaced by the following text:
7. Nothing in this Convention shall affect the liability of any individual for nuclear damage for which the operator, by virtue of paragraph 3 or 5 of this Article, is not liable under this Convention and which that individual caused by an act or omission done with intent to cause damage.

ARTICLE 7

1. The text of Article V of the 1963 Vienna Convention is replaced by the following text:
1. The liability of the operator may be limited by the Installation State for any one nuclear incident, either -
- (a) to not less than 300 million SDRs; or
 - (b) to not less than 150 million SDRs provided that in excess of that amount and up to at least 300 million SDRs public funds shall be made available by that State to compensate nuclear damage; or
 - (c) for a maximum of 15 years from the date of entry into force of this Protocol, to a transitional amount of not less than 100 million SDRs in respect of a nuclear incident occurring within that period. An amount lower than 100 million SDRs may be established, provided that public funds shall be made available by that State to compensate nuclear damage between that lesser amount and 100 million SDRs.
2. Notwithstanding paragraph 1 of this Article, the Installation State, having regard to the nature of the nuclear installation or the nuclear substances involved and to the likely consequences of an incident originating therefrom, may establish a lower amount of liability of the operator, provided that in no event shall any amount so established be less than 5 million SDRs, and provided that the Installation State ensures that public funds shall be made available up to the amount established pursuant to paragraph 1.

3. The amounts established by the Installation State of the liable operator in accordance with paragraphs 1 and 2 of this Article and paragraph 6 of Article IV shall apply wherever the nuclear incident occurs.

2. After Article V, four new Articles V A, V B, V C and V D are added as follows:

ARTICLE V A

1. Interest and costs awarded by a court in actions for compensation of nuclear damage shall be payable in addition to the amounts referred to in Article V.

2. The amounts mentioned in Article V and paragraph 6 of Article IV may be converted into national currency in round figures.

ARTICLE V B

Each Contracting Party shall ensure that persons suffering damage may enforce their rights to compensation without having to bring separate proceedings according to the origin of the funds provided for such compensation.

ARTICLE V C

1. If the courts having jurisdiction are those of a Contracting Party other than the Installation State, the public funds required under sub-paragraphs (b) and (c) of paragraph 1 of Article V and under paragraph 1 of Article VII, as well as interest and costs awarded by a court, may be made available by the first-named Contracting Party. The Installation State shall reimburse to the other Contracting Party any such sums paid. These two Contracting Parties shall agree on the procedure for reimbursement.

2. If the courts having jurisdiction are those of a Contracting Party other than the Installation State, the Contracting Party whose courts have jurisdiction shall take all measures necessary to enable the Installation State to intervene in proceedings and to participate in any settlement concerning compensation.

ARTICLE V D

1. A meeting of the Contracting Parties shall be convened by the Director General of the International Atomic Energy Agency to amend the limits of liability referred to in Article V if one-third of the Contracting Parties express a desire to that effect.

2. Amendments shall be adopted by a two-thirds majority of the Contracting Parties present and voting, provided that at least one-half of the Contracting Parties shall be present at the time of the voting.

3. When acting on a proposal to amend the limits, the meeting of the Contracting Parties shall take into account, inter alia, the risk of damage resulting from a nuclear incident, changes in the monetary values, and the capacity of the insurance market.
4. (a) Any amendment adopted in accordance with paragraph 2 of this Article shall be notified by the Director General of the IAEA to all Contracting Parties for acceptance. The amendment shall be considered accepted at the end of a period of 18 months after it has been notified provided that at least one-third of the Contracting Parties at the time of the adoption of the amendment by the meeting have communicated to the Director General of the IAEA that they accept the amendment. An amendment accepted in accordance with this paragraph shall enter into force 12 months after its acceptance for those Contracting Parties which have accepted it.

(b) If, within a period of 18 months from the date of notification for acceptance, an amendment has not been accepted in accordance with sub-paragraph (a), the amendment shall be considered rejected.
5. For each Contracting Party accepting an amendment after it has been accepted but not entered into force or after its entry into force in accordance with paragraph 4 of this Article, the amendment shall enter into force 12 months after its acceptance by that Contracting Party.
6. A State which becomes a Party to this Convention after the entry into force of an amendment in accordance with paragraph 4 of this Article shall, failing an expression of a different intention by that State -
 - (a) be considered as a Party to this Convention as so amended; and
 - (b) be considered as a Party to the unamended Convention in relation to any State Party not bound by the amendment.

ARTICLE 8

Article VI of the 1963 Vienna Convention is amended as follows:

1. Paragraph 1 is replaced by the following text:
 1. (a) Rights of compensation under this Convention shall be extinguished if an action is not brought within -
 - (i) with respect to loss of life and personal injury, thirty years from the date of the nuclear incident;
 - (ii) with respect to other damage, ten years from the date of the nuclear incident.
 - (b) If, however, under the law of the Installation State, the liability of the operator is covered by insurance or other financial security including State funds for a longer period, the law of the competent court may provide that rights of compensation against the operator shall only be

extinguished after such a longer period which shall not exceed the period for which his liability is so covered under the law of the Installation State.

- (c) Actions for compensation with respect to loss of life and personal injury or, pursuant to an extension under sub-paragraph (b) of this paragraph with respect to other damage, which are brought after a period of ten years from the date of the nuclear incident shall in no case affect the rights of compensation under this Convention of any person who has brought an action against the operator before the expiry of that period.

2. Paragraph 2 is deleted.

3. Paragraph 3 is replaced by the following text:

3. Rights of compensation under the Convention shall be subject to prescription or extinction, as provided

by the law of the competent court, if an action is not brought within three years from the date on which the person suffering damage had knowledge or ought reasonably to have had knowledge of the damage and of the operator liable for the damage, provided that the periods established pursuant to sub-paragraphs (a) and (b) of paragraph 1 of this Article shall not be exceeded.

ARTICLE 9

Article VII is amended as follows:

- 1. In paragraph 1, the following two sentences are added at the end of the paragraph and the paragraph so amended becomes sub-paragraph (a) of that paragraph:

Where the liability of the operator is unlimited, the Installation State may establish a limit of the financial security of the operator liable, provided that such limit is not lower than 300 million SDRs. The Installation State shall ensure the payment of claims for compensation for nuclear damage which have been established against the operator to the extent that the yield of the financial security is inadequate to satisfy such claims, but not in excess of the amount of the financial security to be provided under this paragraph.

- 2. A new sub-paragraph (b) is added to paragraph 1 as follows:

- (c) Notwithstanding sub-paragraph (a) of this paragraph, where the liability of the operator is unlimited, the

Installation State, having regard to the nature of the nuclear installation or the nuclear substances involved and to the likely consequences of an incident originating therefrom, may establish a lower amount of financial security of the operator, provided that in no event shall any amount so established be less than 5 million SDRs, and provided that the Installation State ensures the payment of claims for compensation for nuclear damage which have been established against the operator by providing necessary funds to the extent that the yield of insurance or other financial security

is inadequate to satisfy such claims, and up to the limit provided pursuant to sub-paragraph (a) of this paragraph.

3. In paragraph 3, the words “or sub-paragraphs (b) and (c) of paragraph 1 of Article V” are inserted after the words “of this Article”.

ARTICLE 10

Article VIII of the 1963 Vienna Convention is amended as follows:

1. The text of Article VIII becomes paragraph 1 of that Article.
2. A new paragraph 2 is added as follows:
 2. Subject to application of the rule of sub-paragraph (c) of paragraph 1 of Article VI, where in respect of claims brought against the operator the damage to be compensated under this Convention exceeds, or is likely to exceed, the maximum amount made available pursuant to paragraph 1 of Article V, priority in the distribution of the compensation shall be given to claims in respect of loss of life or personal injury.

ARTICLE 11

In Article X of the 1963 Vienna Convention, a new sentence is added at the end of the Article as follows:

The right of recourse provided for under this Article may also be extended to benefit the Installation State insofar as it has provided public funds pursuant to this Convention.

ARTICLE 12

Article XI of the 1963 Vienna Convention is amended as follows:

1. A new paragraph 1bis is added as follows:
 - 1bis. Where a nuclear incident occurs within the area of the exclusive economic zone of a Contracting Party or, if such a zone has not been established, in an area not exceeding the limits of an exclusive economic zone, were one to be established, jurisdiction over actions concerning nuclear damage from that nuclear incident shall, for the purposes of this Convention, lie only with the courts of that Party. The preceding sentence shall apply if that Contracting Party has notified the Depositary of such area prior to the nuclear incident. Nothing in this paragraph shall be interpreted as permitting the exercise of

jurisdiction in a manner which is contrary to the international law of the sea, including the United Nations Convention on the Law of the Sea.

2. Paragraph 2 is replaced by the following text:

2. Where a nuclear incident does not occur within the territory of any Contracting Party, or within an area notified pursuant to paragraph 1bis, or where the place of the nuclear incident cannot be determined with certainty, jurisdiction over such actions shall lie with the courts of the Installation State of the operator liable.

3. In paragraph 3, first line, and in sub-paragraph (b), after the figure “1”, insert “; 1bis”.

4. A new paragraph 4 is added as follows:

4. The Contracting Party whose courts have jurisdiction shall ensure that only one of its courts shall have jurisdiction in relation to any one nuclear incident.

ARTICLE 13

After Article XI a new Article XI A is added as follows:

ARTICLE XI A

The Contracting Party whose courts have jurisdiction shall ensure that in relation to actions for compensation of nuclear damage -

- (a) any State may bring an action on behalf of persons who have suffered nuclear damage, who are nationals of that State or have their domicile or residence in its territory, and who have consented thereto; and
- (b) any person may bring an action to enforce rights under this Convention acquired by subrogation or assignment.

ARTICLE 14

The text of Article XII of the 1963 Vienna Convention is replaced by the following text:

ARTICLE XII

1. A judgment that is no longer subject to ordinary forms of review entered by a court of a Contracting Party having jurisdiction shall be recognized, except -

- (a) where the judgment was obtained by fraud;
- (b) where the party against whom the judgment was pronounced was not given a fair opportunity to present his case; or
- (c) where the judgment is contrary to the public policy of the Contracting Party within the territory of which recognition is sought, or is not in accord with fundamental standards of justice.

2. A judgment which is recognized under paragraph 1 of this Article shall, upon being presented for enforcement in accordance with the formalities required by the law of the Contracting Party where enforcement is sought, be enforceable as if it were a judgment of a court of that Contracting Party. The merits of a claim on which the judgment has been given shall not be subject to further proceedings.

ARTICLE 15

Article XIII of the 1963 Vienna Convention is amended as follows:

1. The text of Article XIII becomes paragraph 1 of that Article.
2. A new paragraph 2 is added as follows:
 2. Notwithstanding paragraph 1 of this Article, insofar as compensation for nuclear damage is in excess of 150 million SDRs, the legislation of the Installation State may derogate from the provisions of this Convention with respect to nuclear damage suffered in the territory, or in any maritime zone established in accordance with the international law of the sea, of another State which at the time of the incident, has a nuclear installation in such territory, to the extent that it does not afford reciprocal benefits of an equivalent amount.

ARTICLE 16

The text of Article XVIII of the 1963 Vienna Convention is replaced by the following text:

This Convention shall not affect the rights and obligations of a Contracting Party under the general rules of public international law.

ARTICLE 17

After Article XX of the 1963 Vienna Convention a new Article XX A is added as follows:

ARTICLE XX A

1. In the event of a dispute between Contracting Parties concerning the interpretation or application of this Convention, the parties to the dispute shall consult with a view to the settlement of the dispute by negotiation or by any other peaceful means of settling disputes acceptable to them.
2. If a dispute of this character referred to in paragraph 1 of this Article cannot be settled within six months from the request for consultation pursuant to paragraph 1 of this Article, it shall, at the request of any party to such dispute, be submitted to arbitration or referred to the International Court of Justice for decision. Where a dispute is submitted to arbitration, if, within six months from the date of the request, the parties to the dispute are unable to agree on the organization of the arbitration, a party may request

the President of the International Court of Justice or the Secretary-General of the United Nations to appoint one or more arbitrators. In cases of conflicting requests by the parties to the dispute, the request to the Secretary-General of the United Nations shall have priority.

3. When ratifying, accepting, approving or acceding to this Convention, a State may declare that it does not consider itself bound by either or both of the dispute settlement procedures provided for in paragraph 2 of this Article. The other Contracting Parties shall not be bound by a dispute settlement procedure provided for in paragraph 2 of this Article with respect to a Contracting Party for which such a declaration is in force.

4. A Contracting Party which has made a declaration in accordance with paragraph 3 of this Article may at any time withdraw it by notification to the depositary.

ARTICLE 18

1. Articles XX to XXV, paragraphs 2, 3 and paragraph number “1.” of Article XXVI, Articles XXVII and XXIX of the 1963 Vienna Convention are deleted.

2. The 1963 Vienna Convention and this Protocol shall, as between the Parties to this Protocol, be read and interpreted together as one single text that may be referred to as the 1997 Vienna Convention on Civil Liability for Nuclear Damage.

ARTICLE 19

1. A State which is a Party to this Protocol but not a Party to the 1963 Vienna Convention shall be bound by the provisions of that Convention as amended by this Protocol in relation to other States Parties hereto, and failing an expression of a different intention by that State at the time of deposit of an instrument referred to in Article 20 shall be bound by the provisions of the 1963 Vienna Convention in relation to States which are only Parties thereto.

2. Nothing in this Protocol shall affect the obligations of a State which is a Party both to the 1963 Vienna Convention and to this Protocol with respect to a State which is a Party to the 1963 Vienna Convention but not a Party to this Protocol.

ARTICLE 20

1. This Protocol shall be open for signature by all States at the Headquarters of the International Atomic Energy Agency in Vienna from 29 September 1997 until its entry into force.

2. This Protocol is subject to ratification, acceptance or approval by States which have signed it.

3. After its entry into force, any State which has not signed this Protocol may accede to it.

4. The instruments of ratification, acceptance, approval or accession shall be deposited with the Director General of the International Atomic Energy Agency, who shall be the depositary of this Protocol.

ARTICLE 21

1. This Protocol shall enter into force three months after the date of deposit of the fifth instrument of ratification, acceptance or approval.

2. For each State ratifying, accepting, approving or acceding to this Protocol after the deposit of the fifth instrument of ratification, acceptance or approval, this Protocol shall enter into force three months after the date of deposit by such State of the appropriate instrument.

ARTICLE 22

1. Any Contracting Party may denounce this Protocol by written notification to the depositary.

2. Denunciation shall take effect one year after the date on which the notification is received by the depositary.

3. As between the Parties to this Protocol, denunciation by any of them of the 1963 Vienna Convention in accordance with its Article XXVI shall not be construed in any way as denunciation of the 1963 Vienna Convention as amended by this Protocol.

4. Notwithstanding a denunciation of this Protocol by a Contracting Party pursuant to this Article, the provisions of this Protocol shall continue to apply to any nuclear damage caused by a nuclear incident occurring before such denunciation takes effect.

ARTICLE 23

The depositary shall promptly notify States Parties and all other States of:

- (a) each signature of this Protocol;
- (b) each deposit of an instrument of ratification, acceptance, approval or accession;
- (c) the entry into force of this Protocol;
- (d) any notification received pursuant to paragraph 1bis of Article XI;
- (e) requests for the convening of a revision conference pursuant to Article XXVI of the 1963 Vienna Convention and for a meeting of the Contracting Parties pursuant to Article V D of the 1963 Vienna Convention as amended by this Protocol;
- (f) notifications of denunciations received pursuant to Article 22 and other pertinent notifications relating to this Protocol.

ARTICLE 24

1. The original of this Protocol, of which Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the depositary.
2. The International Atomic Energy Agency shall establish the consolidated text of the 1963 Vienna Convention as amended by this Protocol in the Arabic, Chinese, English, French, Russian and Spanish languages as set forth in the annex to this Protocol.
3. The depositary shall communicate to all States the certified true copies of this Protocol together with the consolidated text of the 1963 Vienna Convention as amended by this Protocol.

IN WITNESS WHEREOF the undersigned, being duly authorized

thereto, have signed this Protocol. Done at Vienna, the twelfth

day of September, one thousand nine hundred and ninety-

seven.

Appendix 11:IAEA Convention on Supplementary Compensation for Nuclear Damage Source: International Atomic Energy Agency (IAEA)

CONVENTION ON SUPPLEMENTARY COMPENSATION FOR NUCLEAR DAMAGE

THE CONTRACTING PARTIES,

RECOGNIZING the importance of the measures provided in the Vienna Convention on Civil Liability for Nuclear Damage and the Paris Convention on Third Party Liability in the Field of Nuclear Energy as well as in national legislation on compensation for nuclear damage consistent with the principles of these Conventions;

DESIROUS of establishing a worldwide liability regime to supplement and enhance these measures with a view to increasing the amount of compensation for nuclear damage;

RECOGNIZING further that such a worldwide liability regime would encourage regional and global cooperation to promote a higher level of nuclear safety in accordance with the principles of international partnership and solidarity;

HAVE AGREED as follows:

CHAPTER I

GENERAL PROVISIONS

Article I

Definitions

For the purposes of this Convention:

- (a) “Vienna Convention” means the Vienna Convention on Civil Liability for Nuclear Damage of 21 May 1963 and any amendment thereto which is in force for a Contracting Party to this Convention.
- (b) “Paris Convention” means the Paris Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960 and any amendment thereto which is in force for a Contracting Party to this Convention.
- (c) “Special Drawing Right”, hereinafter referred to as SDR, means the unit of account defined by the International Monetary Fund and used by it for its own operations and transactions.
- (d) “Nuclear reactor” means any structure containing nuclear fuel in such an arrangement that a self-sustaining chain process of nuclear fission can occur therein without an additional source of neutrons.
- (e) “Installation State”, in relation to a nuclear installation, means the Contracting Party within whose territory that installation is situated or, if it is not situated within the territory of any State, the Contracting Party by which or under the authority of which the nuclear installation is operated.
- (f) “Nuclear Damage” means:

- (i) loss of life or personal injury;
 - (ii) loss of or damage to property;
- and each of the following to the extent determined by the law of the competent court:
- (iii) economic loss arising from loss or damage referred to in sub-paragraph (i) or (ii), insofar as not included in those sub-paragraphs, if incurred by a person entitled to claim in respect of such loss or damage;
 - (iv) the costs of measures of reinstatement of impaired environment, unless such impairment is insignificant, if such measures are actually taken or to be taken, and insofar as not included in sub-paragraph (ii);

- (v) loss of income deriving from an economic interest in any use or enjoyment of the environment, incurred as a result of a significant impairment of that environment, and insofar as not included in sub-paragraph (ii);
- (vi) the costs of preventive measures, and further loss or damage caused by such measures;
- (vii) any other economic loss, other than any caused by the impairment of the environment, if permitted by the general law on civil liability of the competent court,

in the case of sub-paragraphs (i) to (v) and (vii) above, to the extent that the loss or damage arises out of or results from ionizing radiation emitted by any source of radiation inside a nuclear installation, or emitted from nuclear fuel or radioactive products or waste in, or of nuclear material coming from, originating in, or sent to, a nuclear installation, whether so arising from the radioactive properties of such matter, or from a combination of radioactive properties with toxic, explosive or other hazardous properties of such matter.

- (g) “Measures of reinstatement” means any reasonable measures which have been approved by the competent authorities of the State where the measures were taken, and which aim to reinstate or restore damaged or destroyed components of the environment, or to introduce, where reasonable, the equivalent of these components into the environment. The law of the State where the damage is suffered shall determine who is entitled to take such measures.
- (h) “Preventive measures” means any reasonable measures taken by any person after a nuclear incident has occurred to prevent or minimize damage referred to in sub-paragraphs (f)(i) to (v) or (vii), subject to any approval of the competent authorities required by the law of the State where the measures were taken.
- (i) “Nuclear incident” means any occurrence or series of occurrences having the same origin which causes nuclear damage or, but only with respect to preventive measures, creates a grave and imminent threat of causing such damage.
- (j) “Installed nuclear capacity” means for each Contracting Party the total of the number of units given by the formula set out in Article IV.2; and “thermal power” means the maximum thermal power authorized by the competent national authorities.
- (k) “Law of the competent court” means the law of the court having jurisdiction under this Convention, including any rules of such law relating to conflict of laws.
- (l) “Reasonable measures” means measures which are found under the law of the competent court to be appropriate and proportionate, having regard to all the circumstances, for example:

- (i) the nature and extent of the damage incurred or, in the case of preventive measures, the nature and extent of the risk of such damage;
- (ii) the extent to which, at the time they are taken, such measures are likely to be effective; and
- (iii) relevant scientific and technical expertise.

Article II

Purpose and Application

1. The purpose of this Convention is to supplement the system of compensation provided pursuant to national law which:
 - (a) implements one of the instruments referred to in Article I (a) and (b); or
 - (b) complies with the provisions of the Annex to this Convention.
2. The system of this Convention shall apply to nuclear damage for which an operator of a nuclear installation used for peaceful purposes situated in the territory of a Contracting Party is liable under either one of the Conventions referred to in Article I or national law mentioned in paragraph 1(b) of this Article.
3. The Annex referred to in paragraph 1(b) shall constitute an integral part of this Convention.

CHAPTER II

COMPENSATION

Article III

Undertaking

1. Compensation in respect of nuclear damage per nuclear incident shall be ensured by the following means:
 - (a) (i) the Installation State shall ensure the availability of 300 million SDRs or a greater amount that it may have specified to the Depositary at any time prior to the nuclear incident, or a transitional amount pursuant to subparagraph (ii);
 - (ii) a Contracting Party may establish for the maximum of 10 years from the date of the opening for signature of this Convention, a transitional amount of at least 150 million SDRs in respect of a nuclear incident occurring within that period.
 - (b) beyond the amount made available under sub-paragraph (a), the Contracting Parties shall make available public funds according to the formula specified in Article IV.
2. (a) Compensation for nuclear damage in accordance with paragraph 1(a) shall be distributed equitably
 - without discrimination on the basis of nationality, domicile or residence, provided that the law of the Installation State may, subject to obligations

- of that State under other conventions on nuclear liability, exclude nuclear damage suffered in a non-Contracting State.
- (b) Compensation for nuclear damage in accordance with paragraph 1(b), shall, subject to Articles V and XI.1(b), be distributed equitably without discrimination on the basis of nationality, domicile or residence.
3. If the nuclear damage to be compensated does not require the total amount under paragraph 1(b), the contributions shall be reduced proportionally.
4. The interest and costs awarded by a court in actions for compensation of nuclear damage are payable in addition to the amounts awarded pursuant to paragraphs 1(a) and (b) and shall be proportionate to the actual contributions made pursuant to paragraphs 1(a) and (b), respectively, by the operator liable, the Contracting Party in whose territory the nuclear installation of that operator is situated, and the Contracting Parties together.

Article IV

Calculation of Contributions

1. The formula for contributions according to which the Contracting Parties shall make available the public funds referred to in Article III.1(b) shall be determined as follows:
- (a) (i) the amount which shall be the product of the installed nuclear capacity of that Contracting Party multiplied by 300 SDRs per unit of installed capacity; and
 - (ii) the amount determined by applying the ratio between the United Nations rate of assessment for that Contracting Party as assessed for the year preceding the year in which the nuclear incident occurs, and the total of such rates for all Contracting Parties to 10% of the sum of the amounts calculated for all Contracting Parties under sub-paragraph (i).
 - (b) Subject to sub-paragraph (c), the contribution of each Contracting Party shall be the sum of the amounts referred to in sub-paragraphs (a)(i) and (ii), provided that States on the minimum United Nations rate of assessment with no nuclear reactors shall not be required to make contributions.
 - (c) The maximum contribution which may be charged per nuclear incident to any Contracting Party, other than the Installation State, pursuant to sub-paragraph (b) shall not exceed its specified percentage of the total of contributions of all Contracting Parties determined pursuant to sub-paragraph (b). For a particular Contracting Party, the specified percentage shall be its UN rate of assessment expressed as a percentage plus 8 percentage points. If, at the time an incident occurs, the total installed capacity represented by the Parties to this Convention is at or above a level of 625,000 units, this percentage shall be increased by one percentage point. It shall be increased by one additional percentage point for each increment of 75,000 units by which the capacity exceeds 625,000 units.
2. The formula is for each nuclear reactor situated in the territory of the Contracting Party, 1 unit for each MW of thermal power. The formula shall be calculated on the basis of the thermal power of the nuclear reactors shown at the date of the

nuclear incident in the list established and kept up to date in accordance with Article VIII.

3. For the purpose of calculating the contributions, a nuclear reactor shall be taken into account from that date when nuclear fuel elements have been first loaded into the nuclear reactor. A nuclear reactor shall be excluded from the calculation when all fuel elements have been removed permanently from the reactor core and have been stored safely in accordance with approved procedures.

Article V

Geographical Scope

1. The funds provided for under Article III.1(b) shall apply to nuclear damage which is suffered:
 - (a) in the territory of a Contracting Party; or
 - (b) in or above maritime areas beyond the territorial sea of a Contracting Party:
 - (i) on board or by a ship flying the flag of a Contracting Party, or on board or by an aircraft registered in the territory of a Contracting Party, or on or by an artificial island, installation or structure under the jurisdiction of a Contracting Party; or
 - (ii) by a national of a Contracting Party;excluding damage suffered in or above the territorial sea of a State not Party to this Convention; or
 - (c) in or above the exclusive economic zone of a Contracting Party or on the continental shelf of a Contracting Party in connection with the exploitation or the exploration of the natural resources of that exclusive economic zone or continental shelf;

provided that the courts of a Contracting Party have jurisdiction pursuant to Article XIII.

2. Any signatory or acceding State may, at the time of signature of or accession to this Convention or on the deposit of its instrument of ratification, declare that for the purposes of the application of paragraph 1(b)(ii), individuals or certain categories thereof, considered under its law as having their habitual residence in its territory, are assimilated to its own nationals.

3. In this article, the expression “a national of a Contracting Party” shall include a Contracting Party or any of its constituent sub-divisions, or a partnership, or any public or private body whether corporate or not established in the territory of a Contracting Party.

CHAPTER III

ORGANIZATION OF SUPPLEMENTARY FUNDING

Article VI

Notification of Nuclear Damage

Without prejudice to obligations which Contracting Parties may have under other international agreements, the Contracting Party whose courts have jurisdiction shall inform the other Contracting Parties of a nuclear incident as soon as it appears that the damage caused by such incident exceeds, or is likely to exceed, the amount available under Article III.1(a) and that contributions under Article III.1(b) may be required. The Contracting Parties shall without delay make all the necessary arrangements to settle the procedure for their relations in this connection.

Article VII

Call for Funds

1. Following the notification referred to in Article VI, and subject to Article X.3, the Contracting Party whose courts have jurisdiction shall request the other Contracting Parties to make available the public funds required under Article III.1(b) to the extent and when they are actually required and shall have exclusive competence to disburse such funds.
2. Independently of existing or future regulations concerning currency or transfers, Contracting Parties shall authorize the transfer and payment of any contribution provided pursuant to Article III.1(b) without any restriction.

Article VIII

List of Nuclear Installations

1. Each Contracting State shall, at the time when it deposits its instrument of ratification, acceptance, approval or accession, communicate to the Depositary a complete listing of all nuclear installations referred to in Article IV.3. The listing shall contain the necessary particulars for the purpose of the calculation of contributions.
2. Each Contracting State shall promptly communicate to the Depositary all modifications to be made to the list. Where such modifications include the addition of a nuclear installation, the communication must be made at least three months before the expected date when nuclear material will be introduced into the installation.
3. If a Contracting Party is of the opinion that the particulars, or any modification to be made to the list communicated by a Contracting State pursuant to paragraphs 1 and 2, do not comply with the provisions, it may raise objections thereto by addressing them to the Depositary within three months from the date on which it has received notice pursuant to paragraph 5. The Depositary shall forthwith communicate this objection to the State to whose information the objection has been raised. Any unresolved differences shall be dealt with in accordance with the dispute settlement procedure laid down in Article XVI.
4. The Depositary shall maintain, update and annually circulate to all Contracting States the list of nuclear installations established in accordance with this Article. Such list shall consist of all the particulars and modifications

referred to in this Article, it being understood that objections submitted under this Article shall have effect retrospective to the date on which they were raised, if they are sustained.

5. The Depositary shall give notice as soon as possible to each Contracting Party of the communications and objections which it has received pursuant to this Article.

Article IX

Rights of Recourse

1. Each Contracting Party shall enact legislation in order to enable both the Contracting Party in whose territory the nuclear installation of the operator liable is situated and the other Contracting Parties who have paid contributions referred to in Article III.1(b), to benefit from the operator's right of recourse to the extent that he has such a right under either one of the Conventions referred to in Article I or national legislation mentioned in Article II.1(b) and to the extent that contributions have been made by any of the Contracting Parties.

2. The legislation of the Contracting Party in whose territory the nuclear installation of the operator liable is situated may provide for the recovery of public funds made available under this Convention from such operator if the damage results from fault on his part.

3. The Contracting Party whose courts have jurisdiction may exercise the rights of recourse provided for in paragraphs 1 and 2 on behalf of the other Contracting Parties which have contributed.

Article X

Disbursements, Proceedings

1. The system of disbursements by which the funds required under Article III.1 are to be made available and the system of apportionment thereof shall be that of the Contracting Party whose courts have jurisdiction.

2. Each Contracting Party shall ensure that persons suffering damage may enforce their rights to compensation without having to bring separate proceedings according to the origin of the funds provided for such compensation and that Contracting Parties may intervene in the proceedings against the operator liable.

3. No Contracting Party shall be required to make available the public funds referred to in Article III.1(b) if claims for compensation can be satisfied out of the funds referred to in Article III.1(a).

Article XI

Allocation of Funds

The funds provided under Article III.1(b) shall be distributed as follows:

1. (a) 50% of the funds shall be available to compensate claims for nuclear damage suffered in or outside the
Installation State;
 - (b) 50% of the funds shall be available to compensate claims for nuclear damage suffered outside the territory of the Installation State to the extent that such claims are uncompensated under sub-paragraph (a).
 - (c) In the event the amount provided pursuant to Article III.1(a) is less than 300 million SDRs:
 - (i) the amount in paragraph 1(a) shall be reduced by the same percentage as the percentage by which the amount provided pursuant to Article III.1(a) is less than 300 million SDR5; and
 - (ii) the amount in paragraph 1(b) shall be increased by the amount of the reduction calculated pursuant to sub-paragraph (i).
2. If a Contracting Party, in accordance with Article III.1(a), has ensured the availability without discrimination of an amount not less than 600 million SDRs, which has been specified to the Depositary prior to the nuclear incident, all funds referred to in Article III.1(a) and (b) shall, notwithstanding paragraph 1, be made available to compensate nuclear damage suffered in and outside the Installation State.

CHAPTER IV

EXERCISE OF OPTIONS

Article XII

1. Except insofar as this Convention otherwise provides, each Contracting Party may exercise the powers vested in it by virtue of the Vienna Convention or the Paris Convention, and any provisions made thereunder may be invoked against the other Contracting Parties in order that the public funds referred to in Article III.1(b) be made available.
2. Nothing in this Convention shall prevent any Contracting Party from making provisions outside the scope of the Vienna or the Paris Convention and of this Convention, provided that such provision shall not involve any further obligation on the part of the other Contracting Parties, and provided that damage in a Contracting Party having no nuclear installations within its territory shall not be excluded from such further compensation on any grounds of lack of reciprocity.
3. (a) Nothing in this Convention shall prevent Contracting Parties from entering into regional or other agreements with the purpose of implementing their obligations under Article III.1(a) or providing additional funds for the

- compensation of nuclear damage, provided that this shall not involve any further obligation under this Convention for the other Contracting Parties.
- (b) A Contracting Party intending to enter into any such agreement shall notify all other Contracting Parties of its intention. Agreements concluded shall be notified to the Depositary.

CHAPTER V

JURISDICTION AND APPLICABLE LAW

Article XIII

Jurisdiction

1. Except as otherwise provided in this article, jurisdiction over actions concerning nuclear damage from a nuclear incident shall lie only with the courts of the Contracting Party within which the nuclear incident occurs.
2. Where a nuclear incident occurs within the area of the exclusive economic zone of a Contracting Party or, if such a zone has not been established, in an area not exceeding the limits of an exclusive economic zone, were one to be established by that Party, jurisdiction over actions concerning nuclear damage from that nuclear incident shall, for the purposes of this Convention, lie only with the courts of that Party. The preceding sentence shall apply if that Contracting Party has notified the Depositary of such area prior to the nuclear incident. Nothing in this paragraph shall be interpreted as permitting the exercise of jurisdiction in a manner which is contrary to the international law of the sea, including the United Nations Convention on the Law of the Sea. However, if the exercise of such jurisdiction is inconsistent with the obligations of that Party under Article XI of the Vienna Convention or Article 13 of the Paris Convention in relation to a State not Party to this Convention jurisdiction shall be determined according to those provisions.
3. Where a nuclear incident does not occur within the territory of any Contracting Party or within an area notified pursuant to paragraph 2, or where the place of a nuclear incident cannot be determined with certainty, jurisdiction over actions concerning nuclear damage from the nuclear incident shall lie only with the courts of the Installation State.

4. Where jurisdiction over actions concerning nuclear damage would lie with the courts of more than one Contracting Party, these Contracting Parties shall determine by agreement which Contracting Party's courts shall have jurisdiction.

5. A judgment that is no longer subject to ordinary forms of review entered by a court of a Contracting Party having jurisdiction shall be recognized except:

- (a) where the judgment was obtained by fraud;
- (b) where the party against whom the judgment was pronounced was not given a fair opportunity to present his case; or
- (c) where the judgment is contrary to the public policy of the Contracting Party within the territory of which recognition is sought, or is not in accord with fundamental standards of justice.

6. A judgment which is recognized under paragraph 5 shall, upon being presented for enforcement in accordance with the formalities required by the law of the Contracting Party where enforcement is sought, be enforceable as if it were a judgment of a court of that Contracting Party. The merits of a claim on which the judgment has been given shall not be subject to further proceedings.

7. Settlements effected in respect of the payment of compensation out of the public funds referred to in Article III.1(b) in accordance with the conditions established by national legislation shall be recognized by the other Contracting Parties.

Article XIV

Applicable Law

1. Either the Vienna Convention or the Paris Convention or the Annex to this Convention, as appropriate, shall apply to a nuclear incident to the exclusion of the others.

2. Subject to the provisions of this Convention, the Vienna Convention or the Paris Convention, as appropriate, the applicable law shall be the law of the competent court.

Article XV

Public International Law

This Convention shall not affect the rights and obligations of a Contracting Party under the general rules of public international law.

CHAPTER VI

DISPUTE SETTLEMENT

Article XVI

1. In the event of a dispute between Contracting Parties concerning the interpretation or application of this Convention, the parties to the dispute shall consult with a view to the settlement of the dispute by negotiation or by any other peaceful means of settling disputes acceptable to them.

2. If a dispute of this character referred to in paragraph 1 cannot be settled within six months from the request for consultation pursuant to paragraph 1, it shall, at the request of any party to such dispute, be submitted to arbitration or referred to the International Court of Justice for decision. Where a dispute is submitted to arbitration, if, within six months from the date of the request, the parties to the dispute are unable to agree on the organization of the arbitration, a party may request the President of the International Court of Justice or the Secretary-General of the United Nations to appoint one or more arbitrators. In cases of conflicting requests by the parties to the dispute, the request to the Secretary-General of the United Nations shall have priority.

3. When ratifying, accepting, approving or acceding to this Convention, a State may declare that it does not consider itself bound by either or both of the dispute settlement procedures provided for in paragraph 2. The other Contracting Parties shall not be bound by a dispute settlement procedure provided for in paragraph 2 with respect to a Contracting Party for which such a declaration is in force.

4. A Contracting Party which has made a declaration in accordance with paragraph 3 may at any time withdraw it by notification to the Depositary.

CHAPTER VII

FINAL CLAUSES

Article XVII

Signature

This Convention shall be open for signature, by all States at the Headquarters of the International Atomic Energy Agency in Vienna from 29 September 1997 until its entry into force.

Article XVIII

Ratification, Acceptance, Approval

1. This Convention shall be subject to ratification, acceptance or approval by the signatory States. An instrument of ratification, acceptance or approval shall be accepted only from a State which is a Party to either the Vienna Convention or the Paris Convention, or a State which declares that its national law complies with the provisions of the Annex to this Convention, provided that, in the case of a State having on its territory a nuclear installation as defined in the Convention on Nuclear Safety of 17 June 1994, it is a Contracting State to that Convention.

2. The instruments of ratification, acceptance or approval shall be deposited with the Director General of the International Atomic Energy Agency who shall act as the Depositary of this Convention.

3. A Contracting Party shall provide the Depositary with a copy, in one of the official languages of the United Nations, of the provisions of its national law referred to in Article II.1 and amendments thereto, including any specification made pursuant to Article III.1(a), Article XI.2, or a transitional amount pursuant to Article III.1(a)(ii). Copies of such provisions shall be circulated by the Depositary to all other Contracting Parties.

Article XIX

Accession

1. After its entry into force, any State which has not signed this Convention may accede to it. An instrument of accession shall be accepted only from a State which is a Party to either the Vienna Convention or the Paris Convention, or a State which declares that its national law complies with the provisions of the Annex to this Convention, provided that in the case of a State having on its territory a nuclear installation as defined in the Convention on Nuclear Safety of 17 June 1994, it is a Contracting State to that Convention.

2. The instruments of accession shall be deposited with the Director General of the International Atomic Energy Agency.

3. A Contracting Party shall provide the Depositary with a copy, in one of the official languages of the United Nations, of the provisions of its national law referred to in Article II.1 and amendments thereto, including any specification made pursuant to Article III.1(a), Article XI.2, or a transitional amount pursuant to Article III.1(a)(ii). Copies of such provisions shall be circulated by the Depositary to all other Contracting Parties.

Article XX

Entry Into Force

1. This Convention shall come into force on the ninetieth day following the date on which at least 5 States with a minimum of 400,000 units of installed nuclear capacity have deposited an instrument referred to in Article XVIII.

2. For each State which subsequently ratifies, accepts, approves or accedes to this Convention, it shall enter into force on the ninetieth day after deposit by such State of the appropriate instrument.

Article XXI

Denunciation

1. Any Contracting Party may denounce this Convention by written notification to the Depositary.

2. Denunciation shall take effect one year after the date on which the notification is received by the Depositary.

Article XXII

Cessation

1. Any Contracting Party which ceases to be a Party to either the Vienna Convention or the Paris Convention shall notify the Depositary thereof and of the date of such cessation. On that date such Contracting Party shall have ceased to be a Party to this Convention unless its national law complies with the provisions of the Annex to this Convention and it has so notified the Depositary and provided it with a copy of the provisions of its national law in one of the official languages of the United Nations. Such copy shall be circulated by the Depositary to all other Contracting Parties.
2. Any Contracting Party whose national law ceases to comply with the provisions of the Annex to this Convention and which is not a Party to either the Vienna Convention or the Paris Convention shall notify the Depositary thereof and of the date of such cessation. On that date such Contracting Party shall have ceased to be a Party to this Convention.
3. Any Contracting Party having on its territory a nuclear installation as defined in the Convention on Nuclear Safety which ceases to be Party to that Convention shall notify the depositary thereof and of the date of such cessation. On that date, such Contracting Party shall, notwithstanding paragraphs 1 and 2, have ceased to be a Party to the present Convention.

Article XXIII

Continuance of Prior Rights and Obligations

Notwithstanding denunciation pursuant to Article XXI or cessation pursuant to Article XXII, the provisions of this Convention shall continue to apply to any nuclear damage caused by a nuclear incident which occurs before such denunciation or cessation.

Article XXIV

Revision and Amendments

1. The Depositary, after consultations with the Contracting Parties, may convene a conference for the purpose of revising or amending this Convention.
2. The Depositary shall convene a conference of Contracting Parties for the purpose of revising or amending this Convention at the request of not less than one-third of all Contracting Parties.

Article XXV

Amendment by Simplified Procedure

1. A meeting of the Contracting Parties shall be convened by the Depositary to amend the compensation amounts referred to in Article III.1(a) and (b) or categories of installations including contributions payable for them, referred to in Article IV.3, if one-third of the Contracting Parties express a desire to that effect.
2. Decisions to adopt a proposed amendment shall be taken by vote. Amendments shall be adopted if no negative vote is cast.
3. Any amendment adopted in accordance with paragraph 2 shall be notified by the Depositary to all Contracting Parties. The amendment shall be considered accepted if within a period of 36 months after it has been notified, all Contracting Parties at the time of the adoption of the amendment have communicated their acceptance to the Depositary. The amendment shall enter into force for all Contracting Parties 12 months after its acceptance.
4. If, within a period of 36 months from the date of notification for acceptance the amendment has not been accepted in accordance with paragraph 3, the amendment shall be considered rejected.
5. When an amendment has been adopted in accordance with paragraph 2 but the 36 months period for its acceptance has not yet expired, a State which becomes a Party to this Convention during that period shall be bound by the amendment if it comes into force. A State which becomes a Party to this Convention after that period shall be bound by any amendment which has been accepted in accordance with paragraph 3. In the cases referred to in the present paragraph, a Contracting Party shall be bound by an amendment when that amendment enters into force, or when this Convention enters into force for that Contracting Party, whichever date is the later.

Article XXVI

Functions of the Depositary

In addition to functions in other Articles of this Convention, the Depositary shall promptly notify Contracting Parties and all other States as well as the Secretary-General of the Organization for Economic Co-operation and Development of:

- (a) each signature of this Convention;
- (b) each deposit of an instrument of ratification, acceptance, approval or accession concerning this Convention;
- (c) the entry into force of this Convention;
- (d) declarations received pursuant to Article XVI;
- (e) any denunciation received pursuant to Article XXI, or notification received pursuant to Article XXII;
- (f) any notification under paragraph 2 of Article XIII;
- (g) other pertinent notifications relating to this Convention.

Article XXVII

Authentic Texts

The original of this Convention, of which Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Director General of the International Atomic Energy Agency who shall send certified copies thereof to all States.

IN WITNESS WHEREOF, THE UNDERSIGNED, BEING DULY
AUTHORIZED THERETO, HAVE SIGNED THIS
CONVENTION.

Done at Vienna, this twelfth day of September, one thousand nine hundred
ninety-seven.

ANNEX

A Contracting Party which is not a Party to any of the Conventions mentioned in Article I(a) or (b) of this Convention shall ensure that its national legislation is consistent with the provisions laid down in this Annex insofar as those provisions are not directly applicable within that Contracting Party. A Contracting Party having no nuclear installation on its territory is required to have only that legislation which is necessary to enable such a Party to give effect to its obligations under this Convention.

Article 1

Definitions

1. In addition to the definitions in Article I of this Convention, the following definitions apply for the purposes of this Annex:

- (a) “Nuclear Fuel” means any material which is capable of producing energy by a self-sustaining chain process of nuclear fission.
- (b) “Nuclear Installation” means:
 - (i) any nuclear reactor other than one with which a means of sea or air transport is equipped for use as a source of power, whether for propulsion thereof or for any other purpose;
 - (ii) any factory using nuclear fuel for the production of nuclear material, or any factory for the processing of nuclear material, including any factory for the re-processing of irradiated nuclear fuel; and
 - (iii) any facility where nuclear material is stored, other than storage incidental to the carriage of such material;provided that the Installation State may determine that several nuclear installations of one operator which are located at the same site shall be considered as a single nuclear installation.
- (c) “Nuclear material” means:
 - (i) nuclear fuel, other than natural uranium and depleted uranium, capable of producing energy by a self-sustaining chain process of nuclear fission

- outside a nuclear reactor, either alone or in combination with some other material; and
- (ii) radioactive products or waste.
- (d) “Operator”, in relation to a nuclear installation, means the person designated or recognized by the Installation State as the operator of that installation.
- (e) “Radioactive products or waste” means any radioactive material produced in, or any material made radioactive by exposure to the radiation incidental to the production or utilization of nuclear fuel, but does not include radioisotopes which have reached the final stage of fabrication so as to be usable for any scientific medical, agricultural, commercial or industrial purpose.

2. An Installation State may, if the small extent of the risks involved so warrants, exclude any nuclear installation or small quantities of nuclear material from the application of this Convention, provided that:

- (a) with respect to nuclear installations, criteria for such exclusion have been established by the Board of Governors of International Atomic Energy Agency and any exclusion by an Installation State satisfies such criteria; and
- (b) with respect to small quantities of nuclear material, maximum limits for the exclusion of such quantities have been established by the Board of Governors of the International Atomic Energy Agency and any exclusion by an Installation State is within such established limits.

The criteria for the exclusion of nuclear installations and the maximum limits for the exclusion of small quantities of nuclear material shall be reviewed periodically by the Board of Governors.

Article 2

Conformity of Legislation

1. The national law of a Contracting Party is deemed to be in conformity with the provisions of Articles 3, 4, 5 and 7 if it contained on 1 January 1995 and continues to contain provisions that:

- (a) provide for strict liability in the event of a nuclear incident where there is substantial nuclear damage off the site of the nuclear installation where the incident occurs;
- (b) require the indemnification of any person other than the operator liable for nuclear damage to the extent that person is legally liable to provide compensation; and
- (c) ensure the availability of at least 1000 million SDRs in respect of a civil nuclear power plant and at least 300 million SDRs in respect of other civil nuclear installations for such indemnification.

2. If in accordance with paragraph I, the national law of a Contracting Party is deemed to be in conformity with the provision of Articles 3, 4, 5 and 7, then that Party:

- (a) may apply a definition of nuclear damage that covers loss or damage set forth in Article I(f) of this Convention and any other loss or damage to the extent that the loss or damage arises out of or results from the radioactive properties, or a combination of radioactive properties with toxic, explosive or other hazardous properties of nuclear fuel or radioactive products or waste in, or of nuclear

- material coming from, originating in, or sent to, a nuclear installation; or other ionizing radiation emitted by any source of radiation inside a nuclear installation, provided that such application does not affect the undertaking by that Contracting Party pursuant to Article III of this Convention; and
- (b) may apply the definition of nuclear installation in paragraph 3 of this Article to the exclusion of the definition in Article 1.1(b) of this Annex.

3. For the purpose of paragraph 2 (b) of this Article, “nuclear installation” means:

- (a) any civil nuclear reactor other than one with which a means of sea or air transport is equipped for use as a source of power, whether for propulsion thereof or any other purpose; and
- (b) any civil facility for processing, reprocessing or storing:
- (i) irradiated nuclear fuel; or
 - (ii) radioactive products or waste that:
 - (1) result from the reprocessing of irradiated nuclear fuel and contain significant amounts of fission products; or
 - (2) contain elements that have an atomic number greater than 92 in concentrations greater than 10 nano-curies per gram.
- (c) any other civil facility for processing, reprocessing or storing nuclear material unless the Contracting Party determines the small extent of the risks involved with such an installation warrants the exclusion of such a facility from this definition.

4. Where that national law of a Contracting Party which is in compliance with paragraph 1 of this Article does not apply to a nuclear incident which occurs outside the territory of that Contracting Party, but over which the courts of that Contracting Party have jurisdiction pursuant to Article XIII of this Convention, Articles 3 to 11 of the Annex shall apply and prevail over any inconsistent provisions of the applicable national law.

Article 3

Operator Liability

1. The operator of a nuclear installation shall be liable for nuclear damage upon proof that such damage has been caused by a nuclear incident:

- (a) in that nuclear installation; or
- (b) involving nuclear material coming from or originating in that nuclear installation, and occurring:
- (i) before liability with regard to nuclear incidents involving the nuclear material has been assumed, pursuant to the express terms of a contract in writing, by the operator of another nuclear installation;
 - (ii) in the absence of such express terms, before the operator of another nuclear installation has taken charge of the nuclear material; or
 - (iii) where the nuclear material is intended to be used in a nuclear reactor with which a means of transport is equipped for use as a source of power, whether for propulsion thereof or for any other purpose, before the person duly authorized to operate such reactor has taken charge of the nuclear material; but

- (iv) where the nuclear material has been sent to a person within the territory of a non-Contracting State, before it has been unloaded from the means of transport by which it has arrived in the territory of that non-Contracting State;
- (c) involving nuclear material sent to that nuclear installation, and occurring:
 - (i) after liability with regard to nuclear incidents involving the nuclear material has been assumed by the operator pursuant to the express terms of a contract in writing, from the operator of another nuclear installation;
 - (ii) in the absence of such express terms, after the operator has taken charge of the nuclear material; or
 - (iii) after the operator has taken charge of the nuclear material from a person operating a nuclear reactor with which a means of transport is equipped for use as a source of power, whether for propulsion thereof or for any other purpose; but
 - (iv) where the nuclear material has, with the written consent of the operator, been sent from a person within the territory of a non-Contracting State, only after it has been loaded on the means of transport by which it is to be carried from the territory of that State;

provided that, if nuclear damage is caused by a nuclear incident occurring in a nuclear installation and involving nuclear material stored therein incidentally to the carriage of such material, the provisions of sub-paragraph (a) shall not apply where another operator or person is solely liable pursuant to sub-paragraph (b) or (c).

2. The Installation State may provide by legislation that, in accordance with such terms as may be specified in that legislation, a carrier of nuclear material or a person handling radioactive waste may, at such carrier or such person's request and with the consent of the operator concerned, be designated or recognized as operator in the place of that operator in respect of such nuclear material or radioactive waste respectively. In this case such carrier or such person shall be considered, for all the purposes of this Convention, as an operator of a nuclear installation situated within the territory of that State.

3. The liability of the operator for nuclear damage shall be absolute.

4. Whenever both nuclear damage and damage other than nuclear damage have been caused by a nuclear incident or jointly by a nuclear incident and one or more other occurrences, such other damage shall, to the extent that it is not reasonably separable from the nuclear damage, be deemed to be nuclear damage caused by that nuclear incident. Where, however, damage is caused jointly by a nuclear incident covered by the provisions of this Annex and by an emission of ionizing radiation not covered by it, nothing in this Annex shall limit or otherwise affect the

liability, either as regards any person suffering nuclear damage or by way of recourse or contribution, of any person who may be held liable in connection with that emission of ionizing radiation.

5. (a) No liability shall attach to an operator for nuclear damage caused by a nuclear incident directly due to an act of armed conflict, hostilities, civil war or insurrection.

- (b) Except insofar as the law of the Installation State may provide to the contrary, the operator shall not be liable for nuclear damage caused by a nuclear incident caused directly due to a grave natural disaster of an exceptional character.
6. National law may relieve an operator wholly or partly from the obligation to pay compensation for nuclear damage suffered by a person if the operator proves the nuclear damage resulted wholly or partly from the gross negligence of that person or an act or omission of that person done with the intent to cause damage.
7. The operator shall not be liable for nuclear damage:
- (a) to the nuclear installation itself and any other nuclear installation, including a nuclear installation under construction, on the site where that installation is located; and
 - (b) to any property on that same site which is used or to be used in connection with any such installation;
 - (c) unless otherwise provided by national law, to the means of transport upon which the nuclear material involved was at the time of the nuclear incident. If national law provides that the operator is liable for such damage, compensation for that damage shall not have the effect of reducing the liability of the operator in respect of other damage to an amount less than either 150 million SDRs, or any higher amount established by the legislation of a Contracting Party.
8. Nothing in this Convention shall affect the liability outside this Convention of the operator for nuclear damage for which by virtue of paragraph 7(c) he is not liable under this Convention.
9. The right to compensation for nuclear damage may be exercised only against the operator liable, provided that national law may permit a direct right of action against any supplier of funds that are made available pursuant to provisions in national law to ensure compensation through the use of funds from sources other than the operator.
10. The operator shall incur no liability for damage caused by a nuclear incident outside the provisions of national law in accordance with this Convention.

Article 4

Liability Amounts

1. Subject to Article III.1(a)(ii), the liability of the operator may be limited by the Installation State for anyone nuclear incident, either:
- (a) to not less than 300 million SDRs; or
 - (b) to not less than 150 million SDRs provided that in excess of that amount and up to at least 300 million SDRs public funds shall be made available by that State to compensate nuclear damage.
2. Notwithstanding paragraph 1, the Installation State, having regard to the nature of the nuclear installation or the nuclear substances involved and to the likely consequences of an incident originating therefrom, may establish a lower amount of

liability of the operator, provided that in no event shall any amount so established be less than

5 million SDRs, and provided that the Installation State ensures that public funds shall be made available up to the amount established pursuant to paragraph 1.

3. The amounts established by the Installation State of the liable operator in accordance with paragraphs 1 and 2, as well as the provisions of any legislation of a Contracting Party pursuant to Article 3.7(c), shall apply wherever the nuclear incident occurs.

Article 5

Financial Security

1. (a) The operator shall be required to have and maintain insurance or other financial security covering his liability for nuclear damage in such amount, of such type and in such terms as the Installation State shall specify. The Installation State shall ensure the payment of claims for compensation for nuclear damage which have been established against the operator by providing the necessary funds to the extent that the yield of insurance or other financial security is inadequate to satisfy such claims, but not in excess of the limit, if any, established pursuant to Article 4. Where the liability of the operator is unlimited, the Installation State may establish a limit of the financial security of the operator liable provided that such limit is not lower than 300 million SDRs. The Installation State shall ensure the payment of claims for compensation for nuclear damage which have been established against the operator to the extent that yield of the financial security is inadequate to satisfy such claims, but not in excess of the amount of the financial security to be provided under this paragraph.
(b) Notwithstanding sub-paragraph (a), the Installation State, having regard to the nature of the nuclear installation or the nuclear substances involved and to the likely consequences of an incident originating there from, may establish a lower amount of financial security of the operator, provided that in no event shall any amount so established be less than 5 million SDRs, and provided that the Installation State ensures the payment of claims for compensation for nuclear damage which have been established against the operator by providing necessary funds to the extent that the yield of insurance or other financial security is inadequate to satisfy such claims, and up to the limit provided in sub-paragraph (a).
2. Nothing in paragraph 1 shall require a Contracting Party or any of its constituent subdivisions to maintain insurance or other financial security to cover their liability as operators.
3. The funds provided by insurance, by other financial security or by the Installation State pursuant to paragraph 1 or Article 4.1(b) shall be exclusively available for compensation due under this Annex.

4. No insurer or other financial guarantor shall suspend or cancel the insurance or other financial security provided pursuant to paragraph 1 without giving notice in writing of at least two months to the competent public authority or, in so far as such insurance or other financial security relates to the carriage of nuclear material, during the period of the carriage in question.

Article 6

Carriage

1. With respect to a nuclear incident during carriage, the maximum amount of liability of the operator shall be governed by the national law of the Installation State.
2. A Contracting Party may subject carriage of nuclear material through its territory to the condition that the amount of liability of the operator be increased to an amount not to exceed the maximum amount of liability of the operator of a nuclear installation situated in its territory.
3. The provisions of paragraph 2 shall not apply to:
 - (a) carriage by sea where, under international law, there is a right of entry in cases of urgent distress into ports of a Contracting Party or a right of innocent passage through its territory;
 - (b) carriage by air where, by agreement or under international law, there is a right to fly over or land on the territory of a Contracting Party.

Article 7

Liability of More Than One Operator

1. Where nuclear damage engages the liability of more than one operator, the operators involved shall, in so far as the damage attributable to each operator is not reasonably separable, be jointly and severally liable. The Installation State may limit the amount of public funds made available per incident to the difference, if any, between the amounts hereby established and the amount established pursuant to Article 4.1.
2. Where a nuclear incident occurs in the course of carriage of nuclear material, either in one and the same means of transport, or, in the case of storage incidental to the carriage, in one and the same nuclear installation, and causes nuclear damage which engages the liability of more than one operator, the total liability shall not exceed the highest amount applicable with respect to anyone of them pursuant to Article 4.
3. In neither of the cases referred to in paragraphs 1 and 2 shall the liability of anyone operator exceed the amount applicable with respect to him pursuant to Article 4.
4. Subject to the provisions of paragraphs 1 to 3, where several nuclear installations of one and the same operator are involved in one nuclear incident, such operator shall be liable in respect of each nuclear installation involved up to the amount

applicable with respect to him pursuant to Article 4. The Installation State may limit the amount of public funds made available as provided for in paragraph 1.

Article 8

Compensation Under National Law

1. For purposes of this Convention, the amount of compensation shall be determined without regard to any interest or costs awarded in a proceeding for compensation of nuclear damage.
2. Compensation for damage suffered outside the Installation State shall be provided in a form freely transferable among Contracting Parties.
3. Where provisions of national or public health insurance, social insurance, social security, workmen's compensation or occupational disease compensation systems include compensation for nuclear damage, rights of beneficiaries of such systems and rights of recourse by virtue of such systems shall be determined by the national law of the Contracting Party in which such systems have been established or by the regulations of the intergovernmental organization which has established such systems.

Article 9

Period of Extinction

1. Rights of compensation under this Convention shall be extinguished if an action is not brought within ten years from the date of the nuclear incident. If, however, under the law of the Installation State the liability of the operator is covered by insurance or other financial security or by State funds for a period longer than ten years, the law of the competent court may provide that rights of compensation against the operator shall only be extinguished after a period which may be longer than ten years, but shall not be longer than the period for which his liability is so covered under the law of the Installation State.
2. Where nuclear damage is caused by a nuclear incident involving nuclear material which at the time of the nuclear incident was stolen, lost, jettisoned or abandoned, the period established pursuant to paragraph 1 shall be computed from the date of that nuclear incident but the period shall in no case, subject to legislation pursuant to paragraph 1, exceed a period of twenty years from the date of the theft, loss, jettison or abandonment.
3. The law of the competent court may establish a period of extinction or prescription of not less than three years from the date on which the person suffering nuclear damage had knowledge or should have had knowledge of the damage and of the operator liable for the damage, provided that the period established pursuant to paragraphs 1 and 2 shall not be exceeded.
4. If the national law of a Contracting Party provides for a period of extinction or prescription greater than ten years from the date of a nuclear incident, it shall

contain provisions for the equitable and timely satisfaction of claims for loss of life or personal injury filed within ten years from the date of the nuclear incident.

Article 10

Right of Recourse

National law may provide that the operator shall have a right of recourse only:

- (a) if this is expressly provided for by a contract in writing; or
- (b) if the nuclear incident results from an act or omission done with intent to cause damage, against the individual who has acted or omitted to act with such intent.

Article 11

Applicable Law

Subject to the provisions of this Convention, the nature, form, extent and equitable distribution of compensation for nuclear damage caused by a nuclear incident shall be governed by the law of the competent court.

Appendix 12: IAEA 1988 Joint Protocol on the Application of the Vienna and Paris Conventions Source: International Atomic Energy Agency (IAEA)

**JOINT PROTOCOL RELATING TO THE
APPLICATION OF
THE VIENNA CONVENTION AND THE PARIS
CONVENTION**

THE CONTRACTING PARTIES

HAVING REGARD to the Vienna Convention on Civil Liability for Nuclear Damage of 21 May 1963;

HAVING REGARD to the Paris Convention on Third Party Liability in the Field of Nuclear Energy of

29 July 1960 as amended by the Additional Protocol of 28 January 1964 and by the Protocol of 16 November 1982; CONSIDERING that the Vienna Convention and the Paris Convention are similar in substance and that no State is at present a Party to both Conventions;

CONVINCED that adherence to either Convention by Parties to the other Convention could lead to difficulties resulting from the simultaneous application of both Conventions to a nuclear incident; and

DESIROUS to establish a link between the Vienna Convention and the Paris Convention by mutually extending the benefit of the special regime of civil liability for nuclear damage set forth under each Convention and to eliminate conflicts arising from the simultaneous applications of both Conventions to a nuclear incident;

HAVE AGREED as follows:

ARTICLE I

In this Protocol:

- (a) “Vienna Convention” means the Vienna Convention on Civil Liability for Nuclear Damage of 21 May 1963 and any amendment thereto which is in force for a Contracting Party to this Protocol;

- (b) “Paris Convention” means the Paris Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960 and any amendment thereto which is in force for a Contracting Party to this Protocol.

ARTICLE II

For the purpose of this Protocol:

- (a) The operator of a nuclear installation situated in the territory of a Party to the Vienna Convention shall be liable in accordance with that Convention for nuclear damage suffered in the territory of a Party to both the Paris Convention and this Protocol;
- (b) The operator of a nuclear installation situated in the territory of a Party to the Paris Convention shall be liable in accordance with that Convention for nuclear damage suffered in the territory of a Party to both the Vienna Convention and this Protocol.

ARTICLE III

1. Either the Vienna Convention or the Paris Convention shall apply to a nuclear incident to the exclusion of the other.
2. In the case of a nuclear incident occurring in a nuclear installation, the applicable Convention shall be that to which the State is a Party within whose territory that installation is situated.
3. In the case of a nuclear incident outside a nuclear installation and involving nuclear material in the course of carriage, the applicable Convention shall be that to which the State is a Party within whose territory the nuclear installation is situated whose operator is liable pursuant to either Article II.1(b) and (c) of the Vienna Convention or Article 4(a) and (b) of the Paris Convention.

ARTICLE IV

1. Articles I to XV of the Vienna Convention shall be applied, with respect to the Contracting Parties to this Protocol which are Parties to the Paris Convention, in the same manner as between Parties to the Vienna Convention.
2. Articles 1 to 14 of the Paris Convention shall be applied, with respect to the Contracting Parties to this Protocol which are Parties to the Vienna Convention, in the same manner as between Parties to the Paris Convention.

ARTICLE V

This Protocol shall be open for signature, from 21 September 1988 until the date of its entry into force, at the Headquarters of the International Atomic Energy Agency by all States which have signed, ratified or acceded to either the Vienna Convention or the Paris Convention.

ARTICLE VI

1. This Protocol is subject to ratification, acceptance, approval or accession. Instruments of ratification, acceptance or approval shall only be accepted from States Party to either the Vienna Convention or the Paris Convention. Any such State which has not signed this Protocol may accede to it.
2. The instruments of ratification, acceptance, approval or accession shall be deposited with the Director General of the International Atomic Energy Agency, who is hereby designated as the depositary of this Protocol.

ARTICLE VII

1. This Protocol shall come into force three months after the date of deposit of instruments of ratification, acceptance, approval or accession by at least five States Party to the Vienna Convention and five States Party to the Paris Convention. For each State ratifying, accepting, approving or acceding to this Protocol after the deposit of the above-mentioned instruments this Protocol shall enter into force three months after the date of deposit of the instrument of ratification, acceptance, approval or accession.
2. This Protocol shall remain in force as long as both the Vienna Convention and the Paris Convention are in force.

ARTICLE VIII

1. Any Contracting Party may denounce this Protocol by written notification to the depositary.
2. Denunciation shall take effect one year after the date on which the notification is received by the depositary.

ARTICLE IX

1. Any Contracting Party which ceases to be a Party to either the Vienna Convention or the Paris Convention shall notify the depositary of the termination of the application of that Convention with respect to it and of the date such termination takes effect.
2. This Protocol shall cease to apply to a Contracting Party which has terminated application of either the Vienna Convention or the Paris Convention on the date such termination takes effect.

ARTICLE X

The depositary shall promptly notify Contracting Parties and States invited to the Conference on the relationship between the Paris Convention and the Vienna

Convention as well as the Secretary General of the Organisation for Economic Co-operation and Development of:

- (a) Each signature of this Protocol;
- (b) Each deposit of an instrument of ratification, acceptance, approval or accession concerning this Protocol;
- (c) The entry into force of this Protocol;
- (d) Any denunciation; and
- (e) Any information received pursuant to Article IX.

ARTICLE XI

The original of this Protocol, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the depositary, who shall send certified copies to Contracting Parties and States invited to the Conference on the relationship between the Paris Convention and the Vienna Convention as well as the Secretary General of the Organisation for Economic Co-operation and Development.

IN WITNESS WHEREOF the undersigned being duly authorized by their respective Governments for that purpose have signed the present Joint Protocol.

DONE at Vienna this twenty-first day of September, one thousand nine hundred and eighty-eight.

Appendix 13: The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) Source: Department for Disarmament Affairs, United Nations (2000).

THE TREATY ON THE NON-PROLIFERATION OF NUCLEAR WEAPONS (NPT)

TEXT OF THE TREATY

The States concluding this Treaty, hereinafter referred to as the Parties to the Treaty,

Considering the devastation that would be visited upon all mankind by a nuclear war and the consequent need to make every effort to avert the danger of such a war and to take measures to safeguard the security of peoples,

Believing that the proliferation of nuclear weapons would seriously enhance the danger of nuclear war,

In conformity with resolutions of the United Nations General Assembly calling for the conclusion of an agreement on the prevention of wider dissemination of nuclear weapons,

Undertaking to co-operate in facilitating the application of International Atomic Energy Agency safeguards on peaceful nuclear activities,

Expressing their support for research, development and other efforts to further the application, within the framework of the International Atomic Energy Agency safeguards system, of the principle of safeguarding effectively the flow of source and special fissionable materials by use of instruments and other techniques at certain strategic points,

Affirming the principle that the benefits of peaceful applications of nuclear technology, including any technological by-products which may be derived by nuclear-weapon States from the development of nuclear explosive devices, should be available for peaceful purposes to all Parties to the Treaty, whether nuclear-weapon or non-nuclear-weapon States,

Convinced that, in furtherance of this principle, all Parties to the Treaty are entitled to participate in the fullest possible exchange of scientific information for, and to contribute alone or in co-operation with other States to, the further development of the applications of atomic energy for peaceful purposes,

Declaring their intention to achieve at the earliest possible date the cessation of the nuclear arms race and to undertake effective measures in the direction of nuclear disarmament,

Urging the co-operation of all States in the attainment of this objective,

Recalling the determination expressed by the Parties to the 1963 Treaty banning nuclear weapons tests in the atmosphere, in outer space and under water in its Preamble to seek to achieve the discontinuance of all test explosions of nuclear weapons for all time and to continue negotiations to this end,

Desiring to further the easing of international tension and the strengthening of trust between States in order to facilitate the cessation of the manufacture of nuclear weapons, the liquidation of all their existing stockpiles, and the elimination from national arsenals of nuclear weapons and the means of their delivery pursuant to a Treaty on general and complete disarmament under strict and effective international control,

Recalling that, in accordance with the Charter of the United Nations, States must refrain in their international relations from the threat or

use of force against the territorial integrity or political independence of any State, or in any other manner inconsistent with the Purposes of the United Nations, and that the establishment and maintenance of international peace and security are to be promoted with the least diversion for armaments of the world's human and economic resources,

Have agreed as follows:

Article I

Each nuclear-weapon State Party to the Treaty undertakes not to transfer to any recipient whatsoever nuclear weapons or other nuclear explosive devices or control over such weapons or explosive devices directly, or indirectly; and not in any way to assist, encourage, or induce any non-nuclear-weapon State to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices, or control over such weapons or explosive devices.

Article II

Each non-nuclear-weapon State Party to the Treaty undertakes not to receive the transfer from any transferor whatsoever of nuclear weapons or other nuclear explosive devices or of control over such weapons or explosive devices directly, or indirectly; not to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices; and not to seek or receive any assistance in the manufacture of nuclear weapons or other nuclear explosive devices.

Article III

1. Each non-nuclear-weapon State Party to the Treaty undertakes to accept safeguards, as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency in accordance with the Statute of the International Atomic Energy Agency and the Agency's safeguards system, for the exclusive purpose

of verification of the fulfillment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices. Procedures for the safeguards required by this Article shall be followed with respect to source or special fissionable material whether it is being produced, processed or used in any principal nuclear facility or is outside any such facility. The safeguards required by this Article shall be applied on all source or special fissionable material in all peaceful nuclear activities within the territory of such State, under its jurisdiction, or carried out under its control anywhere.

2. Each State Party to the Treaty undertakes not to provide: (a) source or special fissionable material, or (b) equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to any non-nuclear-weapon State for peaceful purposes, unless the source or special fissionable material shall be subject to the safeguards required by this Article.

3. The safeguards required by this Article shall be implemented in a manner designed to comply with Article IV of this Treaty, and to avoid hampering the economic or technological development of the Parties or international co-operation in the field of peaceful nuclear activities, including the international exchange of nuclear material and equipment for the processing, use or production of nuclear material for peaceful purposes in accordance with the provisions of this Article and the principle of safeguarding set forth in the Preamble of the Treaty.

4. Non-nuclear-weapon States Party to the Treaty shall conclude agreements with the International Atomic Energy Agency to meet the requirements of this Article either individually or together with other States in accordance with the Statute of the International Atomic Energy Agency. Negotiation of such agreements shall commence within 180 days from the original entry into force of this Treaty. For

States depositing their instruments of ratification or accession after the 180-day period, negotiation of such agreements shall commence not later than the date of such deposit. Such agreements shall enter into force not later than eighteen months after the date of initiation of negotiations.

Article IV

1. Nothing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II of this Treaty.

2. All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. Parties to the Treaty in a position to do so shall also co-operate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world.

Article V

Each Party to the Treaty undertakes to take appropriate measures to ensure that, in accordance with this Treaty, under appropriate international observation and through appropriate international procedures, potential benefits from any peaceful applications of nuclear explosions will be made available to non-nuclear-weapon States Party to the Treaty on a non-discriminatory basis and that the charge to such Parties for the explosive devices used will be as low as possible and exclude any charge for research and development. Non-nuclear-weapon States Party to the Treaty shall be able to obtain such benefits, pursuant to a special international agreement or

agreements, through an appropriate international body with adequate representation of non-nuclear-weapon States. Negotiations on this subject shall commence as soon as possible after the Treaty enters into force. Non-nuclear-weapon States Party to the Treaty so desiring may also obtain such benefits pursuant to bilateral agreements.

Article VI

Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.

Article VII

Nothing in this Treaty affects the right of any group of States to conclude regional treaties in order to assure the total absence of nuclear weapons in their respective territories.

Article VIII

1. Any Party to the Treaty may propose amendments to this Treaty. The text of any proposed amendment shall be submitted to the Depositary Governments which shall circulate it to all Parties to the Treaty. Thereupon, if requested to do so by one-third or more of the Parties to the Treaty, the Depositary Governments shall convene a conference, to which they shall invite all the Parties to the Treaty, to consider such an amendment.
2. Any amendment to this Treaty must be approved by a majority of the votes of all the Parties to the Treaty, including the votes of all nuclear-weapon States Party to the Treaty and all other Parties which, on the date the amendment is circulated, are members of the Board of Governors of the International Atomic Energy Agency. The amendment shall enter into force for each Party that deposits its

instrument of ratification of the amendment upon the deposit of such instruments of ratification by a majority of all the Parties, including the instruments of ratification of all nuclear-weapon States Party to the Treaty and all other Parties which, on the date the amendment is circulated, are members of the Board of Governors of the International Atomic Energy Agency. Thereafter, it shall enter into force for any other Party upon the deposit of its instrument of ratification of the amendment.

3. Five years after the entry into force of this Treaty, a conference of Parties to the Treaty shall be held in Geneva, Switzerland, in order to review the operation of this Treaty with a view to assuring that the purposes of the Preamble and the provisions of the Treaty are being realised. At intervals of five years thereafter, a majority of the Parties to the Treaty may obtain, by submitting a proposal to this effect to the Depositary Governments, the convening of further conferences with the same objective of reviewing the operation of the Treaty.

Article IX

1. This Treaty shall be open to all States for signature. Any State which does not sign the Treaty before its entry into force in accordance with paragraph 3 of this Article may accede to it at any time.

2. This Treaty shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with the Governments of the United Kingdom of Great Britain and Northern Ireland, the Union of Soviet Socialist Republics and the United States of America, which are hereby designated the Depositary Governments.

3. This Treaty shall enter into force after its ratification by the States, the Governments of which are designated Depositaries of the Treaty, and forty other States signatory to this Treaty and the deposit of their instruments of ratification. For the purposes of this Treaty, a nuclear-

weapon State is one which has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967.

4. For States whose instruments of ratification or accession are deposited subsequent to the entry into force of this Treaty, it shall enter into force on the date of the deposit of their instruments of ratification or accession.

5. The Depositary Governments shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification or of accession, the date of the entry into force of this Treaty, and the date of receipt of any requests for convening a conference or other notices.

6. This Treaty shall be registered by the Depositary Governments pursuant to Article 102 of the Charter of the United Nations.

Article X

1. Each Party shall in exercising its national sovereignty have the right to withdraw from the Treaty if it decides that extraordinary events, related to the subject matter of this Treaty, have jeopardized the supreme interests of its country. It shall give notice of such withdrawal to all other Parties to the Treaty and to the United Nations Security Council three months in advance. Such notice shall include a statement of the extraordinary events it regards as having jeopardized its supreme interests.

2. Twenty-five years after the entry into force of the Treaty, a conference shall be convened to decide whether the Treaty shall continue in force indefinitely, or shall be extended for an additional fixed period or periods. This decision shall be taken by a majority of the Parties to the Treaty.¹

Article XI

This Treaty, the English, Russian, French, Spanish and Chinese texts of which are equally authentic, shall be deposited in the archives of the Depositary Governments. Duly certified copies of this Treaty shall be transmitted by the Depositary Governments to the Governments of the signatory and acceding States.

IN WITNESS WHEREOF the undersigned, duly authorized, have signed this Treaty.

DONE in triplicate, at the cities of London, Moscow and Washington, the first day of July, one thousand nine hundred and sixty-eight.

Note:

On 11 May 1995, in accordance with article X, paragraph 2, the Review and Extension Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons decided that the Treaty should continue in force indefinitely (see decision 3).

Appendix 14: Convention on Early Notification of a Nuclear Accident
Source: International Atomic Energy Agency (IAEA)

International Atomic Energy Agency

18 November 1986

INFORMATION CIRCULAR

CONVENTION ON EARLY NOTIFICATION OF A NUCLEAR ACCIDENT

1. The Convention on Early Notification of a Nuclear Accident was adopted by the General Conference at its special session, 24-26 September 1986, and was opened for signature at Vienna on 26 September 1986 and at New York on 6 October 1986. It entered into force on 27 October 1986, i.e. thirty days after the date (26 September 1986) on which three States expressed their consent to be bound by the Convention, as required under Article 12 thereof.
2. The text of the Convention, taken from a certified copy, is reproduced herein for the information of all Members.
3. CONVENTION ON EARLY NOTIFICATION OF A NUCLEAR ACCIDENT
4. THE STATES PARTIES TO THIS CONVENTION, AWARE that nuclear activities are being carried out in a number of States, NOTING that comprehensive measures have been and are being taken to ensure a high level of safety in nuclear activities, aimed at preventing nuclear accidents and minimizing the consequences of any such Event, should it occur,
5. DESIRING to strengthen further international co-operation in the safe development and use of nuclear energy,

6. CONVINCED of the need for States to provide relevant information about nuclear accidents as early as possible in order that transboundary radiological consequences can be minimized,

7. NOTING the usefulness of bilateral and multilateral arrangements on information exchange in this area,

HAVE AGREED as follows:

Article I

Scope of application

1. This Convention shall apply in the event of any accident involving facilities or activities of a State Party or of persons or legal entities under its jurisdiction or control, referred to in paragraph 2 below, from which a release of radioactive material occurs or is likely to occur and which has resulted or may result in an international transboundary release that could be of radiological safety significance for another State.

2. The facilities and activities referred to in paragraph I are the following:

- (a) any nuclear reactor wherever located;
- (b) any nuclear fuel *cycle* facility;
- (c) any radioactive waste management facility;
- (d) the transport and storage of nuclear fuels or radioactive wastes;
- (e) the manufacture, use, storage, disposal and transport of radioisotopes for agricultural, industrial, medical and related scientific and research purposes; and
- (f) the use of radioisotopes for power generation in space objects.

Article 2

Notification and information

In the event of an accident specified in article I (hereinafter referred to as a "nuclear accident"), the State Party referred to in that article shall:

- (a) forthwith notify, directly or through the International Atomic Energy Agency (hereinafter referred to as the "Agency"), those States which are or may be physically affected as specified in article I and the Agency of the nuclear accident, its nature, the time of its occurrence and its exact location where appropriate; and
- (b) promptly provide the States referred to in sub-paragraph (a), directly or through the Agency, and the Agency with such available information relevant to minimizing the radiological consequences in those States, as specified in article 5.

Article 3

Other Nuclear Accidents

With a view to minimizing the radiological consequences, States Parties may notify in the event of nuclear accidents other than those specified in article I.

Article 4

Functions of the Agency

The Agency shall:

- (a) forthwith inform States Parties, Member States, other States which are or may be physically affected as specified in article I and relevant international intergovernmental organizations (hereinafter referred to as "international organizations") of a notification received pursuant to sub-paragraph (a) of article 2; and
- (b) promptly provide any State Party, Member State or relevant international organization, upon request, with the information received pursuant to sub-paragraph (b) of article 2.

Article 5

Information to be provided

I. The information to be provided pursuant to sub-paragraph (b) of article 2 shall comprise the following data as then available to the notifying State Party:

- (a) the time, exact location where appropriate, and the nature of the nuclear accident;
- (b) the facility or activity involved;
- (c) the assumed or established cause and the foreseeable development of the nuclear accident relevant to the transboundary release of the radioactive materials;
- (d) the general characteristics of the radioactive release, including, as far as is practicable and appropriate, the nature, probable physical and chemical form and the quantity, composition and effective height of the radioactive release;
- (e) information on current and forecast meteorological and hydrological conditions, necessary for forecasting the transboundary release of the radioactive materials;
- (f) the results of environmental monitoring relevant to the transboundary release of the radioactive materials;
- (g) the off-site protective measures taken or planned;
- (h) the predicted behaviour over time of the radioactive release.

2. Such information shall be supplemented at appropriate intervals by further relevant information on the development of the emergency situation, including its foreseeable or actual termination.

3. Information received pursuant to sub-paragraph (b) of article 2 may be used without restriction, except when such information is provided in confidence by the notifying State Party.

Article 6

Consultations

A State Party providing information pursuant to sub-paragraph (b) of article 2 shall, as far as is reasonably practicable, respond promptly to a request for further information or consultations sought by an affected State Party with a view to minimizing the radiological consequences in that State.

Article 7

Competent authorities and points of contact

1. Each State Party shall make known to the Agency and to other States Parties, directly or through the Agency, its competent authorities and point of contact responsible for issuing and receiving the notification and information referred to in article 2. Such points of contact and a focal point within the Agency shall be available continuously.
2. Each State Party shall promptly inform the Agency of any changes that may occur in the information referred to in paragraph 1.
3. The Agency shall maintain an up-to-date list of such national authorities and points of contact as well as points of contact of relevant international organizations and shall provide it to States Parties and Member States and to relevant international organizations.

Article 8

Assistance to States Parties

The Agency shall, in accordance with its Statute and upon a request of a State Party which does not have nuclear activities itself and borders on a State having an active nuclear programme but not Party, conduct investigations into the feasibility and establishment of an appropriate radiation monitoring system in order to facilitate the achievement of the objectives of this Convention.

Article 9

Bilateral and multilateral arrangements

In furtherance of their mutual interests, States Parties may consider, where deemed appropriate, the conclusion of bilateral or multilateral arrangements relating to the subject matter of this Convention.

Article 10

Relationship to other international agreements

This Convention shall not affect the reciprocal rights and obligations of States Parties under existing international agreements which relate to the matters covered by this Convention, or under future international agreements concluded in accordance with the object and purpose of this Convention.

Article 11

Settlement of disputes

1. In the event of a dispute between States Parties, or between a State Party and the Agency, concerning the interpretation or application of this Convention, the parties to the dispute shall consult with a view to the settlement of the dispute by negotiation or by any other peaceful means of settling disputes acceptable to them.
2. If a dispute of this character between States Parties cannot be settled within one year from the request for consultation pursuant to paragraph 1, it shall, at the request of any party to such dispute, be submitted to arbitration or referred to the International Court of Justice for decision. Where a dispute is submitted to arbitration, if, within six months from the date of the request, the parties to the dispute are unable to agree on the organization of the arbitration, a party may request the President of the International Court of Justice or the Secretary-General of the United Nations to appoint one or more arbitrators. In cases of conflicting requests by the parties to the dispute, the request to the Secretary-General of the United Nations shall have priority.
3. When signing, ratifying, accepting, approving or acceding to this Convention, a State may declare that it does not consider itself bound by either or both of the dispute settlement procedure provided for in paragraph 2. The other States Parties shall not be bound by a dispute settlement procedure provided for in paragraph 2 with respect to a State Party for which such a declaration is in force.
4. A State Party which has made a declaration in accordance with paragraph 3 may at any time withdraw it by notification to the depositary.

Article 12

Entry into force

5. This Convention shall be open for signature by all States and Namibia, represented by the United Nations Council for Namibia, at the Headquarters of the International Atomic Energy Agency in Vienna and at the Headquarters of the United Nations in New York, from 26 September 1986 and 6 October 1986 respectively, until its entry into force or for twelve months, whichever period is longer.
6. A State and Namibia, represented by the United Nations Council for Namibia, may express its consent to be bound by this Convention either by signature, or by deposit of an instrument of ratification, acceptance or approval following signature made subject to ratification, acceptance or approval, or by deposit of an instrument of

accession. The instruments of ratification, acceptance, approval or accession shall be deposited with the depositary.

7. This Convention shall enter into force thirty days after consent to be bound has been expressed by three States.
8. For each State expressing consent to be bound by this Convention after its entry into force, this Convention shall enter into force for that State thirty days after the date of expression of consent.
9. (a) This Convention shall be open for accession, as provided for in this article, by international organizations and regional integration organizations constituted by sovereign States, which have competence in respect of the negotiation, conclusion and application of international agreements in matters covered by this Convention.
10. In matters within their competence such organizations shall, on their own behalf, exercise the rights and fulfil the obligations which this Convention attributes to States Parties.
11. When depositing its instrument of accession, such an organization shall communicate to the depositary a declaration indicating the extent of its competence in respect of matters covered by this Convention.
12. Such an organization shall not hold any vote additional to those of its Member States.

Article 13

Provisional application

A State may, upon signature or at any later date before this Convention enters into force for it, declare that it will apply this Convention provisionally.

Article 14

Amendments

1. A State Party may propose amendments to this Convention. The proposed amendment shall be submitted to the depositary who shall circulate it immediately to all other States Parties.
2. If a majority of the States Parties request the depositary to convene a conference to consider the proposed amendments, the depositary shall invite all States Parties to attend such a conference to begin not sooner than thirty days after the invitations are issued. Any amendment adopted at the conference by a two-thirds majority of all States Parties shall be laid down in a protocol which is open to signature in Vienna and New York by all States Parties.

3. The protocol shall enter into force thirty days after consent to be bound has been expressed by three States. For each State expressing consent to be bound by the protocol after its entry into force, the protocol shall enter into force for that State thirty days after the date of expression of consent.

Article IS

Denunciation

- I. A State Party may denounce this Convention by written notification to the depositary.
2. Denunciation shall take effect one year following the date on which the notification is received by the depositary.

Article 16

Depositary

1. The Director General of the Agency shall be the depositary of this Convention.
2. The Director General of the Agency shall promptly notify States Parties and all other States of:
 - (a) each signature of this Convention or any protocol of amendment;
 - (b) each deposit of an instrument of ratification, acceptance, approval or accession concerning this Convention or any protocol of amendment;
 - (c) any declaration or withdrawal thereof in accordance with article 11;
 - (d) any declaration of provisional application of this Convention in accordance with article 13;
 - (e) the entry into force of this Convention and of any amendment thereto; and
 - (f) any denunciation made under article 15.

Article 17

Authentic texts and certified copies

The original of this Convention, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Director General of the International Atomic Energy Agency who shall send certified copies to States Parties and all other States.

IN WITNESS WHEREOF the undersigned, being duly authorized, have signed this Convention, open for signature as provided for in paragraph 1 of article 12.

ADOPTED by the General Conference of the International Atomic Energy Agency meeting in special session at Vienna on the twenty-sixth day of September one thousand nine hundred and eighty six.